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DISCUSSION.

Peradeniya, January 15, 1914.

There is no subject that invites discussion to the same extent as agriculture. Here in Ceylon various bodies meet frequently to discuss problems connected with our great industry; in London there is to be an International Rubber Conference in connection with the Rubber Exhibition in June and at the Imperial Institute there will take place at the same time an International Congress of Tropical Agriculture. Agriculture deals with life, and living forces will ever remain a well-spring of study.

Meetings and conferences often do not command the attendance that they might because people are afraid of their time being wasted by much talk and too little real discussion.

Men meet together in order that knowledge of the topic or topics to be discussed shall be advanced and unless that object is fulfilled they meet in vain. This knowledge is advanced in three ways. We first invite one of our number who has specialised, it may be in a particular crop, to give us the result of his experience. This sometimes takes the form of a paper. Others present with experience of the product under discussion then proceed to explain wherein theirs corresponds with or differs

from that of the first speaker. Finally those with little or no experience in the matter, but desirous of acquiring such, describe the perplexities that have arisen in their minds.

These last render perhaps the most valuable service of all because if doubts and difficulties exist and are not disclosed they cannot be answered and men may go away from a meeting with nothing but confused ideas. It is by enquiry that we progress.

In order that all who can shed light on the subject before the meeting shall be given an opportunity of doing so, and that all misunderstandings shall as far as possible be cleared up, speeches must be short. Long speeches kill discussion and frighten busy people away. They must also be relevant because irrelevancy consumes valuable time by leading us out into the wilderness, and there leaving us to retrace our steps. This engenders impatience, disturbs the calm and composure of the atmosphere and injures the reputation of the board, committee or whatever it may be.

The conversational spirit is the one to cultivate. Conversation is the interchange of thought by spoken words though at formal meetings it must of course be controlled by formalities necessary for ordered discussion. Interchange of thought on a particular subject is only possible when speeches are brief and to the point, and when those with ideas will come forward and express them. Dr. Johnson was once asked whether the conversation at a dinner he had attended the previous day had been good. "No, sir," he said, "we had *talk* enough, but no *conversation;* there was nothing *discussed.*"

R. N. L.

TASMANIA FOR THE SETTLER.

Of late years a great deal has been heard about Tasmania, not merely as a health resort, but also as a place of sojourn for the official retiring from the eastern tropics where one could safely invest his small capital, while at the same time enjoying ease and comfort and good health in a delightful climate.

The success of a Ceylon Planter (MR. J. H. BARBER) in the cultivation of apples was recently referred to in the local and Australian Press, and there is little doubt that others from this colony as well as India will follow the lead that has been given.

Tasmanian authorities have just issued a number of attractive publications, of interest to the tourist and prospective settler, which have been distributed through a local agency. From these it is to be gathered that the Colony produces good crops of wheat, oats, barley and potatoes in addition to its flourishing fruit industry. Tasmanian apples are noted for their aroma and flavour ; and, cultivated under suitable conditions, yield excellent returns. In land acquisition the State treats the prospective settler most liberally—the terms of payment being light and spread over a series of years, while assistance is provided under certain conditions in the shape of loans from an agricultural bank. For all details the enquirer must be referred to the handbooks and pamphlets which can be consulted at the Office of the Ceylon Agricultural Society, Peradeniya.

EXPLOSIVES IN AGRICULTURE.

"Dynamite for Agriculture in Ceylon" is the title of a booklet issued by MESSRS. FREUDENBERG & CO., the sole Agents for NOBEL'S HAMBURG EXPLOSIVES CO., LTD. The book is published in order that those who were unable to attend the demonstrations held from time to time may have the opportunity of reading more concerning this important subject. Dynamite as a means of cultivating the soil dates back many years and the first country to experiment with it methodically was America where it has been in vogue for 30 or 40 years. In Ceylon the use of dynamite has been known for many years in connection with the blasting of rocks and work of that nature, but it was only a year or two ago that its practicability for soil cultivation came into general notice. The booklet deals with the general uses for which dynamite is recommended and the methods of using dynamite and cost. It also contains many illustrations some of which are of the demonstration held at Peradeniya on the 10th July last.

"WELLCOME" PHOTOGRAPHIC EXPOSURE RECORD AND DIARY FOR 1914.

We have to thank MESSRS. BURROUGHS, WELLCOME & CO. for a copy of their Photographic Record and Diary for 1914. As a pocket Guide to photography, condensing as it does into the minimum of space clear, definite and precise instructions on all details, it should prove invaluable to the amateur as well as to the professional.

COCONUTS.

MANURING OF COCONUTS IN THE SEYCHELLES.

R. DUPONT.

The quantity of mineral matter removed from the soil by the coconut is considerable when the fibre and leaves are not returned. The copra itself represents a very small proportion, only about one-fifth of this quantity. It is therefore desirable to utilise the leaves and other residues before considering other manures. The writer has studied the coconut fertilisers used on two types of soil in the Seychelles.

MADREPORITIC SOILS.

They occur in the outlying islands, which are extremely fertile owing to deposits of guano having the following composition:—

Moisture	7·20
Organic matter	12·50
Lime	44·30
Magnesia	1·70
Potash	0·38
Phosphoric acid	30·85
Sulphuric acid	0·69
Silica	2·06
Iron, alumina, etc... ...	0·36
	100·04

There is a deficiency of potash, but according to BONAME the coconut utilises considerable quantities of sodium salts during the growth of the inflorescence, and it appears that less potash is consumed and the two bases are interchangeable in the requirements of this plant.

GRANITIC SOILS.

These soils require neutralising with lime or guano. Potash is generally deficient in soils that have been cultivated for a long time. Phosphoric acid is supplied economically by the guano, which costs only 16 to 24*s* per ton at Victoria.

POTASH MANURES.

Sulphate of Potash should be preferred, as the unit of potash in it (at Bombay or Colombo) costs only 4*s*. 9*d*. as compared with 7*s* in kainit. The writer recommends the application of 45 to 90 lb. per acre buried in trenches round the trees.

NITROGENOUS MANURES.

The writer recommends green manures (Tephrosia candida, etc.), seaweed and farmyard manure where possible. An excellent manure for coconuts could be obtained by the organisation of fisheries.—MONTHLY BULLETIN.

COCONUTS IN FIJI.

H. H. THIELE.

(*Continued from page 462, Vol. XLI.*)

"Extensive damage is frequently done to coconuts in some parts of the group by the so called stick insects," writes MR. F. P. JEPSON in his report on Economic Entomology of Fiji, and continues as follows: "These insects, which belong to the family *Phasmidæ*, are extremely voracious, and will often completely defoliate a tree, leaving only the midribs. DR. SHARP refers to them as follows:—They are all vegetable feeders and are extremely voracious, so that a pair will destroy a great quantity of foliage; they are consequently in some parts of the world classed among injurious insects. In Fiji and the Friendly Islands, *Lopaphus cocophagus*' eats the coconut foliage and causes a scarcity of food, so that it becomes a matter of necessity to destroy these insects. Phasmidæ have been reported as causing considerable damage to the coconut plantations on the island of Cicia; they are also common at Savisavu Bay, Wainunu, Suva, Levuka, Mango and in the Lau group.

The damage done by Phasmidæ is very characteristic. Irregular, clean cut patches are eaten out of the leaflets, by means of the very powerful biting jaws with which the insect is provided. Sometimes only a few leaflets are attacked; at other times the damage may be extensive. The writer has seen a palm completely defoliated, only the midribs of the leaflets remaining.

These insects are entirely nocturnal in habits, and conceal themselves under the folded leaflets of the coconut palms during the daytime. There are several representatives of this family in Fiji, the two most important being *Phibalocera pythonius*, Westw., and *Lopaphus cocophagus*, Newp. The former a large green wingless insect, attains a great size, several specimens having been taken over nine inches in length. The latter is a slender brown insect about four and a half inches long. Concerning these two insects MR. LIRKBY writes:—

"The two latter species are common in the South Sea Islands, where *Lopaphus cocophagus* sometimes commits dreadful ravages in the plantations of coconut trees."

The Fijian natives, to whom these insects are known as "mimimata," regard it with a certain amount of awe, on account of its power of ejecting a stinking fluid, said to be very acid, and supposed, if it strikes the eye, to cause blindness. No authentic instance of blindness caused in this fashion is known in Fiji, but it can be well understood that should this fluid strike the eye it would cause a considerable amount of temporary discomfort. The liquid is secreted in the glands of the thorax. Birds are known to prey on Phasmidæ to a very large extent, and there are many instances of parasitism by other insects. Very few eggs are produced considering the large amount of food consumed by these insects. The eggs are deposited by the females at random from the top of the tree on to the ground.

The adult of the *Phibalocera pythonius* is a large, green, bulky-bodied insect provided with powerful mandibles. The length is stated by some residents in Fiji to reach 14 inches, but none in this collection exceed $9\frac{1}{2}$ inches. The breadth is $\frac{5}{8}$ inch. This insect is entirely apterous, and so in order to gain access to the foliage, has to climb the trunk of the palm This fact can be taken advantage of by preventing its ascent by means of some contrivance or preparation placed around the trunk. Representatives of this family have the power of reproducing a lost limb.

The *Lopaphus cocophagus* is much smaller than *Phibalocera pythonius*, rarely exceeding $4\frac{1}{2}$ inches in length, and $\frac{1}{4}$ inch in breadth. The body is slender and brown in colour. The wings and tegmina are very small, and the former cannot be of much use in flight. The eggs of this insect have not been found here.

Probably the most satisfactory, and at the same time least expensive method of dealing with both these insects, where the damage caused was extensive, would be the following:

As has been stated above, Phasmidæ are nocturnal in habits, and during the daytime find shelter beneath the folded leaflets of the palms. If broken and fallen limbs of coconut trees, as well as all debris, such as husks, loose fibre, and cut weeds, etc., are collected and made into a heap beneath each palm, and when dry set fire to, the smoke will cause the insects to release their hold of the leaflets, and falling to the ground they will either be destroyed by fire or else will form an easy prey for birds.

There are many points of interest yet to be discovered concerning these insects, and also the methods for their control.

With reference to these insects I may say they do not appear to by very numerous on Taviuni, and on the plantations I managed I only found one tree attacked (out of a total of some 8,000), and I was constantly on the look-out for more. It is remarkable that there were other palms at the usual distance round the one attacked, the leaves in some places touching those infected, yet the insects did not injure those other trees—at least not during the five years I observed them. I could see no difference whatever between the height of this infested palm and that of the surrounding ones; the stem was slightly thinner; it appeared to be about thirty years old; its leaves were not of a healthy colour and generally half eaten away by the insects, the midribs always being left. I asked a number of old Fijians if they could tell me the reason why this palm in particular suffered, and they all seemed of the same opinion, namely: that the sap of that particular tree was "sweet." Whether it was of a different species of coconut from the surrounding ones the natives did not seem to know. This may or may not be the case; I was however not qualified to further investigate the matter and settle this point.

It appears to me very probable that some varieties of coconut palms may be found which these insects will not attack.

Since writing this article, another troublesome insect has developed into a pest on the banana plantations and will most likely spread to the coconut palms. This is the scale insect, known as *Aspidiotus destructor*, Sign.

In Bulletin No. 5—"Some preliminary Notes on the Scale Insect infesting the Bananas in Fiji," MR. F. P. JEPSON has gathered and published the following information :—

FROGGATT says, "This scale insect was described by SIGNORET from specimens sent to him from Reunion where he says : this species does great damage to the coconut groves of the island."

BANKS says, "*Aspidiotus destructor*, Sign., is by far the most pernicious of the scales which attack the coconut in the Philippines. It occurs most frequently on the young trees having from one to five years' growth, in many cases completely covering the under surfaces of the leaves, giving them a characteristic yellow time."

DOANE, in his notes on the scale in Tahiti, says: "It is one of the greatest pests upon coconut palms in the Society Islands. Here it infests both old and young trees in a similar manner, but on old trees besides the foliage, it spreads over the flower spikes and even the coconuts become coated with the scale. Many trees have been killed, while others, on account of this infestation, bear no nuts, and on some islands, it has become so bad that no nuts are gathered. At one time it appeared as if all the trees would become barren, as all the young palms become smothered with the scale from the older infested trees."

This scale is known as the "Bourbon aspidiotus" in the West Indies, and it is recorded in many West Indian Islands.

URICH, in "Preliminary Notes on some insects affecting the Coconut Palm," Trinidad 1911, says this scale is always associated with ants (Azteca chartifex, Forel) which, being exceedingly fond of the honey-dew secreted by the scales, protect and probably propagate them for purposes of obtaining a food supply. He suggests getting rid of the ants by means of kerosene emulsion and thinks that the scale insect may be left to its parasites.

FROGGATT remarks that although the members of the Aspidiotus group of scales are usually hard and horny, this particular species is much thinner and lighter in texture than most species, and is therefore much more readily destroyed by unfavourable weather conditions and by the attacks of parasites. It is also much more amenable to treatment with spraying or fumigation.

The Superintendent of Agriculture, on his last visit to Taviuni did not find this scale amongst the bananas there. Once there it will be next to impossible to extirpate it. It is not a difficult matter to deal with on the comparatively short banana plants that can easily be sprayed, a treatment which quickly kills this kind of scale owing to its covering being comparatively thin ; but it is a different matter when it has spread to coconut trees, the height of which make spraying impracticable. In fact in such case little or nothing can be done to check or eradicate the pest ; the tall trees if once attacked are almost sure to be killed in time.—FIJI PLANTERS' JOURNAL.

CACAO.

INTRODUCTION INTO CEYLON.

J. H. BARBER.

This being the 400th anniversary of the introduction of cacao into Europe several magazines have thought it fit to deal with its past history, later cultivation, its great value as a nutritious food and its ever increasing popularity. It is estimated that at least 1000 cacao and chocolate factories are employed to-day in working up the raw bean which last year amounted to 440,000,000 lb. for the 12 months. In going into the past history of this product we find that it was brought into Spain in the year 1513 from Mexico where its use was well known, and where the kings were said to have their chocolate served in golden goblets ; so highly prized was the dainty dish that was set before the King. The betrothal of the King of France, LOUIS XIV, to MARIA THERESA, daughter of PHILIP of SPAIN, was the romantic episode which led to its introduction into France. This delicacy, which LINNEUS, the great botanist, in a moment of inspiration named *Theobroma* (the food of the Gods) was forwarded as a gift of great value encased in a costly box to the royal bridegroom.

The cacao industry in Ceylon stands indebted to ROBERT BOYD TYTLER, the then Laird of Pallekelly, foremost in enterprise among the coffee planters of the day. How he harnessed the Mahaveli-ganga to irrigate his coffee fields in times of drought was one of the engineering feats associated with the planting enterprise, and tourists to the mountain capital rarely failed to visit the works.

To the fact that the founder of the industry had gained his planting experiences in Jamaica where he learnt all about cacao in the thirties may be ascribed the idea that suggested itself to his mind to plant cacao in Ceylon ; and so the seed was imported by him somewhere about the early sixties, and two large groups of plants growing luxuriantly at Pallekelly bore testimony to his success, and commanded the admiration of all visitors. But the ubiquitous squirrel, the common enemy of all cacao planters, soon ran riot among the crops and discouraged for a time all further extension. Coffee then was still King and needed no substitute !

In 1873, however, the foresight of the proprietor suggested supplementary products for the estate ; it was in this year too that MR. W. A. TYTLER, who has kindly placed me in possession of some facts and figures not known to me before, arrived in Ceylon ; and to him and his brother ROBERT fell the duties and responsibilities of attending to these other products. After an attempt at cinnamon which was not found quite satisfactory, attention was at last turned seriously to cacao. The destruction of squirrels with fine shot was found effective enough to insure the crops, and a great start was then made in extension, and this takes us just 40 years back and makes this year the 40th anniversary of what may be taken as the beginning of the industry in Ceylon. For we are not interested in the mere existence of trees that may or

may not have been introduced by the Dutch or the Portuguese (in truth there was a tree in Colombo, and a very old tree in Kalutara, before the sixties)—any inquiry of an archæological character—or from a mere botanical point of view being outside the purposes of this paper. I must now let my correspondent relate his own experience in connection with Pallekelly as it fell to his lot to take in

THE FIRST CEYLON CROP OF CACAO.

"My father and brother were both called away on business and I started to carry out instructions in picking and curing. The curing was to be done by burying the seed in trenches and I had no orders as to when to take the seed out. Consequently when my father returned from Colombo later than he intended he asked me what I had done about the curing. I told him I had never removed the cacao from the trenches, and he said they would be all rotten."

The seed, however, when taken out, dried and forwarded to experts for their opinion secured their highest approval followed by a glowing report, which led to further consignments, cured no doubt by the same methods and with protracted underground treatment. It was not long before those who handled the new Ceylon product realized that the old Trinidad red that had disappeared from the West Indian plantations and the European markets had been recalled into existence in the first Crown Colony of Great Britain. The price paid for the product was such as to encourage the most sceptical to put their faith in cacao so much so that an immediate rush followed in Matale, Kurunegala and other lowcountry places, while Pallekelly supplied the seed all round. It was about this time too that the Lèvelle garden, which is still continuing to supply The Grove Cacao Factory with the highly prized Caracas bean for manufacturing purposes, was fully planted out. And on this plantation may be seen the true Caracas still flourishing in all its vigour yielding the average crop unmolested by the helopeltis or disappearing before the fungus which did not fail to visit most plantations at unfavourable seasons. In course of time, however, Ceylon planters found it desirable to introduce the hardier, if coarser, Forestero, which it was thought could be made to take the place of the delicate Caracas: the Peradeniya Gardens too showed a group of Foresteros bearing pods of different colours from grey to brown. These importations were found to have been, in most instances, planted not far from the Caracas, and soon helped to produce hybrids which combined the excellent qualities of the Caracas with the robust habit of the Forestero. The bean in fracture showing much lighter shades than the purplish Forestero, in gradations approaching close to the other parent. The discriminating planter had thus an opportunity to select pods for the later plantations from these varieties which were found, from an economic point of view, to answer him best. The curing methods too, with the gain of experience, underwent many changes to save unnecessary expenditure of time and labour.

The new varieties seemed to yield to a quicker mode of treatment. The Grove Estate's produce, it may be mentioned, had the good fortune to secure the approval of competent judges at exhibitions. SIR ARTHUR HAVELOCK, when he was Governor of Ceylon, manifested a special interest in fostering the cacao industry in the Island. He offered a special prize for the best cured cacao at the Colombo Exhibition held during his term of office and this Estate secured it.

In 1901 the first equipment of machinery for manufacture was received here and the manufactured article made on the estate was brought to the door of the Ceylon consumer and the grocer at a discount of most costs and charges borne by foreign manufacturers. The appearance of an article of unimpeached purity in the land of its growth and production was welcomed by the medical faculty including the Government Analyst and recommended by them for general use. In certain cases of illness it was prescribed freely. Among later officers administering the affairs of the Colony was SIR HENRY BLAKE, one time Governor of Jamaica, who also manifested great interest in general agriculture. Soon after his arrival he travelled to Matale district and paid a visit to the Factory and plantation. When, however, the rubber boom set in, no product was too good to be spared by some of our planters; and the proverbial elasticity of rubber stretched over every district that could grow the product; some proprietors and their advisers not content, however, with growing cacao and rubber side by side and securing the shade of rubber for the cacao in place of the existing shade of jak and the dadap thought it fit, in some places, to cut out the cacao entirely. They may be doubtless well advised in their action but the cacao grower does not for that reason withhold his sympathy from his crop and would fain maintain it in the favoured districts. With the experience now gained by Ceylon planters, it will hold its own against most products. There is already a shrinkage in stocks in the London markets: MESSRS. HARVEY BROS. & CO., writing from Mincing Lane on the 7th November, report that stocks stand at 78,622 bags against 95,176 bags last year. A consequent rising price is only to be expected."

I am informed by MR. TYTLER that in 1882 his respected father, shortly before his death, made a visit to the West Indies, to Trinidad, and wrote a pamphlet on what he saw. The year after he died Pallekelly alone returned a profit of £17,000. The wealth derived by the Colony through the introduction of this product may be accepted as one that amply repaid the enterprising planter from that time to this, as also our beautiful Island.

J. H. BARBER.

The Grove, Ukuwela. 12 December, 1913.

LUCERNE AT PERADENIYA.

The Lucerne in the show-plots has not done well but the larger plot from Indian acclimatised seed is thriving and has been cut once to strengthen it. A mixture of Ashes, Sulphate of Ammonia, Muriate of Potash and Nitrate of Soda has been applied.

D. S. CORLETT,
Manager, Expt. Station.

FIBRES.

SISAL HEMP IN GERMAN EAST AFRICA.

Dr. W. F. BRÜCK.

In the agricultural annals of the German colonies there is perhaps no example of so rapid a development as that of sisal. In 1893 HINDORT, on behalf of the German East Africa Company, bought in Florida 1,000 sisal plants which were sent to the Kikogwe plantation near the mouth of the Pangani; of this number only 62 took root and this is the origin of sisal cultivation in German East Africa which in 1912 occupied 52,750 acres.

EXTENT.

In this colony sisal is cultivated: (1) In the North along the Tanga-Moschi and Korogwe railways at the mouth of the Pangani, (2) from Dar-es-salam to Kilossa, (3) in the South in the Lindi-Mikindani region near the mouth of the Rovuma.

After ceara, sisal is the most important industrial crop of this region.

	Area.		Value of Exports.
	Planted.	Bearing.	
	acres.	acres.	£
Ceara ...	80,724	28,469	233,134
Sisal ...	52,697	28,067	221,002

PROGRESSION OF THE EXPORTS OF SISAL.

1901	...	15 tons.	1910	...	7,000 tons.
1905	...	1,400 ,,	1911	...	10,000 ,,
		1912 ...	16,000 tons.		

VARIETIES.

An unsuccessful attempt was made to introduce white sisal from Yucatan: *Agave fourcroydes* (Lemaire) or *A. elongata* or *A. rigida* var. *elongata*. At present the only variety grown comes from Florida; it is the same as "Henequen verde" of the Spaniards or "gruner Sisal" of the Germans; its botanical names are *Agave sisalana*, Perrime, or *A. rigida* var. *sisalana*.

CLIMATE.

In German East Africa, sisal can be cultivated up to 1,480 feet above sea level, but the best results are obtained below 660 feet. The amount of rainfall may vary from 34 to 48 inches, and it may even sink to 31 inches if the moist and dry seasons are sharply separated.

POSITION OF GERMAN EAST AFRICA IN THE WORLD'S MARKET OF AGAVE FIBRE.

Henequen (Yucatan sisal) ...	136,766 tons	Bahamas ...	3,100
Sisal (Green sisal):		Hawai ...	492
German East Africa ...	15,700 ,,	Papuasia ...	295
Java	3,900 ,,		

Monthly Bulletin.

WILL AMERICAN COTTON ALWAYS BE SUPREME?

Americans have felt quite free to criticise Brazil for the comfortable assurance it has complacently entertained all these years that its rubber would always remain supreme, irrespective of the efforts of the rest of the world to push into the rubber market. The Brazilians have at last seen their mistake, but they did not see it until the production of rubber from the East and other parts of the world had equalled that of the Amazon. Now the question is: Are Americans in a somewhat similar position in regard to cotton? We have rested content for many years in an imperturbable confidence that America in the cotton field would never have a rival. But is this confidence warranted? The cotton production for the current year is estimated at 12 billion pounds, 24 million bales. About two-thirds of this production, or approximately 16 million bales, will be produced on American soil. This still shows a good lead, and there is the additional fact that, taking one year with another, the American production is steadily increasing; but over against this reassuring situation is the incontrovertible fact that foreign production of cotton is increasing vastly faster. In India, for instance, the cotton production in 1910 amounted to 1,400,000 bales. The present year it will reach the very sizable figure of 6,000,000 bales, or an increase of over 300 per cent. in three years. The Middle East has one tremendous advantage over both Brazil and the United States—its great supply of extremely cheap labour. This is what is likely to prove the undoing of Brazil in the rubber market. Will it also prove the undoing of America in the cotton market.

To be sure this is not just at this moment a pressing question, but it is certainly an interesting one.—India Rubber World.

SISAL HEMP.

D. J. STODDART.

In Yucatan the yield ranges from 50 lb. up to 100 lb. of dry fibre per 1,000 leaves. I made here the following 4 tests from leaves of plants in different lowland localities, grown in Jamaica from the real Yucatan Sisal of commerce, the mother plants of which I brought to this island. 1st test, 5 leaves varying in length from 45 to 59 inches gave a result of 8½ ozs. of dried

fibre. This was extracted at Hope Gardens in the presence of MR. W. HARRIS, the Superintendent of Public Gardens and Plantations. The other tests I made afterwards are as follows :—

5	Leaves, Result ...	...	... 7¼ ozs. fibre
5	,, ,, .	...	... 6½ ,, ,,
5	,, ,, ...	...	... 6 ,, ,,

Of these latter three tests, some of the leaves were short and others rather thin, and some at a disadvantage having grown under shade. I purposely took leaves in this manner so as to make thorough tests. Each plant should produce from 30 to 35 ripe leaves per annum or 32 on the average. Making the calculation on the basis of the lowest test of 6 oz. of fibre from 5 leaves, an acre would give not less than 1,440 lb. per annum. Of course there is every likelihood of higher yield being obtained.

Sisal Hemp at 5 to 5¼ cts. per lb. in New York will give when its crop begins, a net profit of about £7 to £8 per acre per annum on its working expense.

The working expense is £5 to £6 per acre per annum at the maximum. I must state that I have also made a test of the leaves of the Sisal plants grown here at an altitude of 1,800 feet, 5 leaves of which yielded 5 ozs. of dried fibre. This I consider very good under the circumstances as the leaves were thin, the plants having shade around them, and not deriving full benefit from the sun which would have thickened them and produced more fibre.

REPORTS AND VALUATIONS.

Conditions as regards cost of labour, etc., are very much the same here as in Yucatan. The following are extracts from letters I have received relative to Sisal hemp.

MESSRS. HANSON & ORTH, Hemp Brokers, New York, writing under date 1st April, 1910, in reply to my letter stated :—

"To-day's market price for Progreso Sisal is 5 cents per lb. net cash ex steamer New York. There is no duty on the article. There is a demand for all the Sisal that comes to market."

MESSRS. IDE & CHRISTIE, Fibre Brokers, London, in their letter 1st April, 1910, referring to my inquiries about Sisal, wrote :—

"We can sell promptly all you send. There is no import duty, all comes in free."

In each of the monthly circulars of IDE & CHRISTIE, London, from January to April, 1910, Mexican Sisal is quoted :—

"Spot quotation £29 per ton, arrival quotation £28 per ton."

The London price may with safety be put down at from £25 to £28 per ton.

I forwarded sample of Sisal hemp grown here to MESSRS HANSON & ORTH, New York, and in their letter dated 27th June, 1910, they reported :—

"Very good length ; strength good. Colour good. We could readily sell it in this market."

To any bona fide planter or individual or company desiring further information with a view to going in for the Sisal hemp industry here and requiring details of cost of cultivation, machinery ; etc., up to the time of harvesting and for reaping crop, etc., I will be prepared to give same. I may mention that the tests made from the Bahama variety of Sisal grown here, yield not more than one half of what the Yucatan Sisal gives, so that it would not be so profitable for us to cultivate the Bahama fibre.—JAMAICA AGRICULTURAL SOCIETY JOURNAL.

TEA CULTIVATION IN CEYLON

[CONSUL HENRY D. BAKER, ON SPECIAL SERVICE.]

Tea cultivation is the greatest source of prosperity to the island of Ceylon, the total value of tea exports approximating over $25,000,000 per year. There are several hundred companies engaged in tea cultivation in this island, nearly all paying dividends of upwards of 7 per cent. on their capital stock and some up to 40 per cent., and also there are about 1,500 private plantations many of which, however, especially in the lowland districts, grow more rubber than tea.

Good tea land at an elevation of 2,000 to 4,000 feet sells for $500 an acre or over, and capital invested in land at such prices can be made to yield 7 per cent. with comparatively little risk. Although a few years ago, at the height of the rubber boom, it appeared as if the tea industry of Ceylon might become subordinate to that of rubber, yet there is now a reaction from such tendency, especially during recent months since the price of rubber has shown a declining tendency. Many plantation owners who several years ago, especially in the lowlands, were growing both tea and rubber and were concluding to devote their lands solely to rubber have more lately decided that tea affords more promise of steady and safe profits.

SEPARATION OF TEA FROM RUBBER.

It is likely, however, that there will in the future be less planting of tea and rubber together, as the two do not seem to grow particularly well, the rubber trees as they develop killing out the tea, and it will probably become more recognized that in all the upland districts tea is the best crop to grow, while in the lowland districts especially suitable for rubber there should be no attempt to cultivate tea. The higher the altitude in Ceylon the better the tea thrives and develops in flavour. Most of the tea is grown at elevations of 1,500 to 5,000, feet. There is considerable Government land in Ceylon at elevations of 5,000 to 7,000 feet now covered with jungle, which might be turned into profitable tea land, except that it is a policy of the Government to conserve such areas to prevent any deforestation such as might unfavourably affect the rainfall of the lower districts.

A visit to the tea districts of Ceylon, such as I have just taken, must forcibly impress one with the magnitude of this industry and the immense financial returns from it. These plantations are not only yielding returns in dividends to outside capitalists, chiefly in England, of highly satisfactory amounts, but more and more they are enriching local people whose investments in Ceylon are considerably increasing and who are now seeking additional fields for investment of capital in tea and rubber plantations in other tropical regions, especially in the Malay Peninsula, Java, and Sumatra.

TEA ON STEEP MOUNTAIN SIDES—COOPERATIVE PLANTERS' ASSOCIATION.

Almost every acre in Ceylon suitable for tea, except on Crown land withheld by the Government, is now closely cultivated with tea or with other suitable crops which can be conveniently raised incidentally with tea, such as cardamoms, cinchona, pepper, etc. As already mentioned, it is now being found that in the best tea districts it is not a wise policy also to raise rubber.

The highland tea growing sections are all very mountainous in character, yet this does not seem to interfere in the least with the tea cultivation, and I was amazed to notice hundreds of coolies weeding, pruning and plucking the tea plant on slopes so precipitous that it seemed almost incredible that they could retain a footing. But the men, women and children engaged in this work, with their feet bare, seemed to find an easy hold on slopes where a white man wearing shoes might easily slip and fall hundreds of feet. Except for a certain amount of land that must necessarily be reserved for roads, pathways and drainage channels, there is none that is not utilized in cultivation.

Most of the tea estates are between the town of Kandy, the ancient capital of Ceylon and famous for its Buddhist temple, about 75 miles from Colombo, 1,700 feet above sea level, and Nuwara Eliya, on a plateau over 6,000 feet above sea level. Kandy is the headquarters of the Ceylon Planters' Association, which is a powerful factor in attending to the needs of planters where cooperative action is desirable, especially in obtaining cooly labourers from southern India. It has a membership of nearly 1,200 estates.

THE LABOUR SYSTEM.

The great requisite of successful tea cultivation in Ceylon is a plentiful supply of cheap labour. Generally speaking it takes 300 coolies to work 400 acres, or, as expressed to me, "three-quarters of a cooly to an acre." The men, who are employed chiefly at manuring, draining, pruning and weeding, get about 11 cents a day American money, and women and children, who are chiefly engaged in plucking the young tea leaves, get about 8 cents a day American money, this being the average although their earnings depend on quickness in piecework. The recruiting of coolies from southern India requires much attention, over 70,000 being imported each year for the plantations by what is known as the "tin-ticket system," the coolies after being engaged by agents of the Planters' Association being supplied with tin tickets which entitle them to transportation and food on the way direct to the estates, the Ceylon Government arranging for their forwarding and care en route and charging the costs to the planters to whom the coolies are consigned. Should cholera or other disease break out while on the journey, or if they were recruited in infected districts in India, they are kept for a considerable time by the Government in detention camps before being allowed to go to the plantations. The chief food of the coolies on the plantations is rice, which costs them about $1.50 per month, and coconuts about $0.45 per month. A long, low building divided into small rooms, known as the "cooly lines," are supplied for the residence of the coolies on each estate.

COST AND SUPPLY OF FERTILIZERS.

Next to the cost of labour, the cost of fertilizers is an element of expense in tea culture. About 1 ton of good fertilizer is required for every 3 acres, or about a quarter of a pound for each plant. The fertilizers are composed chiefly of groundnut cake, castor cake, blood meal, sulphate of ammonia, steamed bones, sulphate of potash, and muriate of potash. The fertilizing materials cost mostly between $40 and $50 per ton. They are put up at factories in Colombo. Generally speaking tea can be produced in Ceylon according to favourableness of locality for about 8 to 10 cents per pound, while the average price for which is sold at local auctions during 1912 was about 15 cents per pound American money. The profit is thus considerable. On many estates it is easily 100 per cent.

The Ceylon Chamber of Commerce estimate of the tea crop for 1913 is 189,000,000 pounds, distributed as follows : To United Kingdom, 113,500,000 ; Russia, 18,500,000 ; Continent, 2,500,000 ; America, 19,000,000 ; Australia, 23,000,000 ; China, 6,500,000 ; other countries, 6,000,000 ;

The following table shows the amount of tea purchased by different countries in Ceylon during the year 1912 :

Countries.	Black.		Green.	
	1911.	1912.	1911.	1912.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
United Kingdom	111,152,838	113,395,510	1,931,839	1,583,789
Russia	16,360,386	14,495,856	4,123,303	2,854,346
Other European Countries	2,383,567	2,497,131	.....	10,155
Australia	22,215,907	23,949,293	453	675
America	16,128,841	16,225,217	2,881,847	3,459,127
China	5,718,708	6,733,270	1,100	.....
All other Countries	4,769,172	5,795,802	7,029	29,216
Total	178,729,419	183,092,079	8,945,571	7,937,308

It will be noticed from the table that Ceylon is principally a black tea country, with the United Kingdom by far the most important customer for black tea, while Australia, America, and Russia come next in the order named. In the minor specialty of green tea the United States is the best customer. It is explained in the last green tea report of the Ceylon Planters' Association that there was a decrease during 1911 in the quantity of green tea taken by the United States, which was the result chiefly of the new American regulations debarring the entry of artificially coloured or polished teas, but that now since the Ceylon trade has become accustomed to the altered conditions there is evidence of an increased demand for "natural leaf" green tea and prospects are good at present for increased business in this line, as noticed by the much larger exports to the United States during 1912.

MANUFACTURING PROCESSES.

The method of manufacturing tea in Ceylon from the green leaf includes four distinct processes, known as withering, rolling, fermenting, and firing. In withering the tea, the leaves are placed on shelves, made of wire or jute

hessian very loosely woven so that the air can pass freely through it. Sometimes, in wet weather especially, this operation is aided by the use of fans. After withering, the tea is put through rollers to squeeze out any remaining moisture and to give the leaf a good twist. It is next put through roll breakers to break up the ball or lumps into which the leaves have formed, and at the same time to sift out any dirt and also to separate the small fine leaves by means of wire mesh on to a cloth placed below to receive it. The leaves are then spread out on wooden frames and covered with wet cloth to induce fermentation until a bright copper tint is obtained, but when green tea is required the fermentation is checked before any change of colour takes place.

The tea is then transferred to wire trays, which are pushed into desiccators through which a current of hot air passes from 210° to 220° F. It is then cooled and afterwards sifted out into various grades. The ratio of green leaf to "made tea" works out at about 4,200 pounds of green leaf to 1,000 pounds of manufactured tea. The tea is then packed by machines into cases made of momi wood imported from Japan and lined with lead paper or aluminum imported from England and is then ready to be transported to Colombo for sale at public auction by the brokers of that city to representatives of foreign firms.

MACHINERY AND FARMING TOOLS.

All of the appliances and machinery used in manufacturing tea in Ceylon are imported from the United Kingdom and as the planters seem well satisfied with the same and see no opportunity for improvement it is natural to expect that the United Kingdom will continue to supply all the mechanical requisites necessary. The cultivation of the tea is all done by hand, no tools being used by the coolies except forks in fertilizing and knives for pruning, which are imported from England.

OPPORTUNITY FOR SUPERINTENDENTS.

I might mention in this connection that there is always a demand for well-qualified persons to act as superintendents on the Ceylon tea plantations at salaries of $150 to $300 per month, and it would seem fortunate if young men from the United States with agricultural and mechanical talent and understanding the special advantages of many articles of American manufacture could be induced to become interested in such work. It is usual for new beginners on plantations to serve as assistants at nominal salaries until they become acquainted with the practical details of the work and able to assume responsibility. During this period of apprenticeship they are known as "creepers." Many of the plantation companies employ inspectors to visit the different estates at a fee of $50 for each estate who give any necessary advice and make confidential reports as to the management. This tends to stimulate attention to scientific and business-like management of the estates.

ALLIUM TRIQUETRUM.

This is the name of a new vegetable from the sandy coast of Algeria. It is closely allied to the leek and is said to be of considerable value as an esculent. The underground part is white and, according to the GARDENER'S CHRONICLE, it forms a delicate vegetable with no odour of garlic.

PADDY.

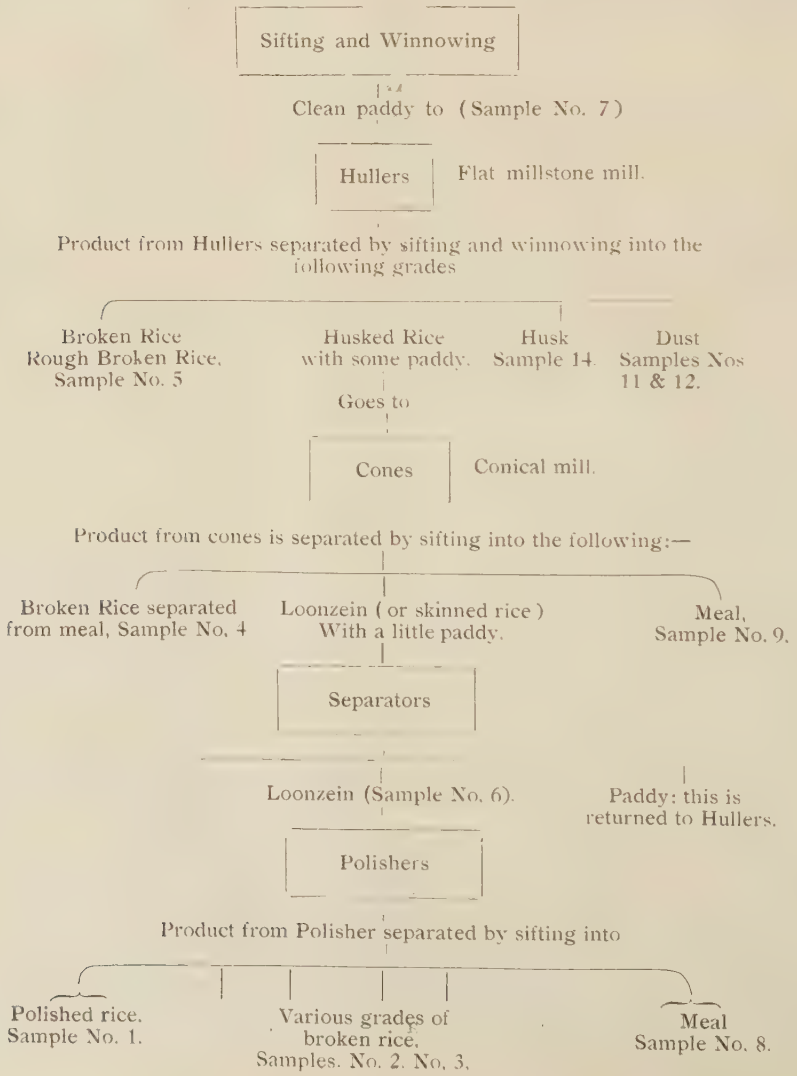
POLISHED RICE.

The following extract is from an article written by MESSRS. F. J. WARTH and D. B. DARABSETT on the Chemical Composition of Paddy Mill Products in BULLETIN No. 10 of the Burma Agricultural Department.

THE MILLING OF PADDY.

The microscopical examination of the cross section of a rice grain shows that it consists essentially of a large inner core of cells filled with starch granules. Surrounding this core is a layer of cells containing much proteid matter and oil. This is the so-called aleurone layer which in its turn is covered by the outer coating or true skin of the seed. The term skin is applied by millers chiefly to the aleurone layer. The embryo forms a small separate part, which in milling is separated from the rice together with the "skin."

It is quite unnecessary to give a detailed description of the methods and machinery employed. However to specify clearly the samples that have been examined an outline of the milling process is necessary. This is made sufficiently clear in the accompanying diagram without further explanation.


Sifting and Winnowing
Clean paddy to (Sample No. 7)
Hullers
Flat millstone mill.
Product from Hullers separated by sifting and winnowing into the following grades
Broken Rice Rough Broken Rice, Sample No. 5
Husked Rice with some paddy.
Husk Sample 14.
Dust Samples Nos 11 & 12.
Goes to
Cones
Conical mill.
Product from cones is separated by sifting into the following:—
Broken Rice separated from meal, Sample No. 4
Loonzein (or skinned rice) With a little paddy.
Meal, Sample No. 9.
Separators
Loonzein (Sample No. 6).
Paddy: this is returned to Hullers.
Polishers
Product from Polisher separated by sifting into
Polished rice, Sample No. 1.
Various grades of broken rice, Samples. No. 2. No. 3.
Meal Sample No. 8.

DESCRIPTION OF PRODUCTS.

The polished rice and broken-rices of the best grades are very clean and pure white. Rough broken rice retains some skin. Broken rice extracted from meal from cones consists of small fragments and contains much skin.

Loonzein is not pure white owing to the presence of outer non-starch cells.

Of the products weighed or estimated the following is a list with somewhat simplified outturn figures—

	Weight Per-cent.
Polished rice, special	55
Broken rice	26
Broken rice	4
Dust	4
Meal	11
Total ...	100

RICE AND MEAL AS FOOD-STUFFS.

The accompanying table shows composition of our rice samples compared with some other rices and with wheat and wheat flour.

Constituents.	Wheat.	Flour, No. 1.	Loon-zein.	Polished Rice.
Moisture	13·40	12·50	13·02	12·90
Oil, etc.	1·71	·81	2·24	·46
Proteid	11·79	9·96	6·91	6·47
Starch, etc.	69·64	76·30	75·71	79·43
Fibre	1·65	—	·68	·25
Ash	1·81	·43	1·44	·49

The two foods polished rice and wheat flour may be considered equally good when they form part of a mixed diet in which the extra proteid required is supplied from some other source.

Where, however, rice forms the complete diet the nutritive ratio (Proteid to Carbo-hydrates) is very low and a small increase in proteids would considerably alter it.

It is just possible therefore that a part of the ill-effects of a diet of polished rice may be due to the very low proteid content.

For the rice miller, however, the Phosphorus content has become a much more urgent problem since it has been shown that an inadequate supply of this element is a predisposing cause of beri-beri.

The Phosphorus content of various food-stuffs consumed by the native population in Calcutta has been determined by HOOPER (1)

This is an important paper which the Rice Millers of Rangoon should refer to. For convenience a summary of MR. HOOPER'S results is here given.

It is important to notice that wheat flour is, if anything, poorer in Phosphoric Acid than our best polished Rangoon rice.

However, wheat flour consumers invariably live on a mixed diet, whilst some rice eaters do not. This explains why no complaint has been raised against the low Phosphoric Acid content of wheat flour.

If unpolished rice be wholesome, while polished rice is not (and we are obliged to believe this), why is it that polished rice is preferred?

That rice eaters prefer polished rice is proved, if proof be required, by HOOPER'S figures where he shows that the price is practically inversely proportional to the Phosphoric Acid content.

The village Burman also is not satisfied with hulled rice. He takes the trouble to pound it again before he considers it fit to eat.

This is a very important point and to obtain some data concerning it I supplied some paddy to villagers to be prepared for their own consumption.

The products from the Burmese hulling and polishing experiments were chemically examined and yielded the following interesting figures:—

	Nitrogen.	Phosphoric Acid
Paddy	1·09	·548
Loonzein	1·28	·697
Polished rice	1·14	·366
Broken rice	1·27	·516

We see results exactly analogous to those obtained by milling—only that in this case the process is not perfectly completed. The polished rice is much poorer than the Loonzein in Phosphoric Acid.

The broken rice has evidently not received much polish and it should and obviously does correspond to broken rice from meal.

If a Burman were asked why he does not eat Loonzein instead of polished rice, he would laugh and tell you that it is impossible to cook Loonzein.

This is an undoubted fact and explains also why the broken rice (which has not received much polish—see analyses above) is never used for cooking.

The more perfect the polish the better does the rice cook, and therefore the preference for highly polished rice is not merely due to its clean white appearance but to the good cooking quality indicated by its appearance.

It is doubtful whether we have as much reason for preferring white bread as the rice eater has for preferring well polished rice.

The question of cooking quality in relation to extent of polishing is one that deserves some study by the millers.

It may just be possible to produce a good cooking rice without polishing quite as much as is the custom.

(1) (Journal Asiatic Society, Volume 7, No. 6, 1911.)

I allow of course that the appearance of the product could not be so good. An experiment of this kind would naturally receive the assistance of the Agricultural Department and should go far to meet the objections raised in certain quarters against highly polished rice.

A chemical test bearing on the question of cooking quality may be mentioned here.

By means of dilute alkali rice grains can be disintegrated and eventually gelatinised, but this action does not take place at all until the outer layers of the grain have been removed.

ECONOMIC PRODUCTS AT PERADENIYA.

TEA.

The yield for the months of August and September has been 3,720 lb. at 6½ cents. Plots 144, 145 and 153 were tipped on 10th October, 3 months after pruning. Plots 145—150, Manipuri Indigenous.

CACAO.

Picking is in progress, the yield being very good. The cacao is bein mostly dried in the drying house owing to heavy rains.

Pod fungus (*Phytophthora faberi*) is very prevalent, but the percentage, as far as can be judged at present, does not seem to be very much higher than last year for the corresponding months, i.e., about 17%

The previous spraying experiments were carried on for 9 years: 3 years on selected plots and 6 years over the whole.

Squirrels are also making considerable depredations and a special man has been put on to shoot these during the season.

The reserved 40 acre plot has hitherto been a refuge for the squirrels and a breeding place for canker and fungus, not having been cultivated for several years. This is now being cleared with a view to part of it being laid out in economic products.

A round of pruning and removing suckers has been completed. The stools of old trees cut down are sending up strong shoots.

COFFEE.

Spraying the Coffees for green bug (*Coccus viridis*) still continues, the pest not having yet been got rid of. Three Robusta coffee bushes and one control have been taken to test further whether the fungus (*Cephalosporium lecanii*) could be spread artificially. The results were fairly satisfactory.

The *Leucaena glauca* has been topped and heavily pruned, the leaves being mulched to the bushes, in the Robusta and Liberia coffee plots, as the shade seemed too dense.

D. S. CORLETT.

October, 1913.

DRY FARMING.

A SUBSIDIARY CONSIDERATION IN DRY FARMING.

W. J. DAWSON.

The subject of dry farming is, perhaps, of no great interest to us at present as our farming districts are generally favoured with a well-distributed ample rainfall. We have usually enough rain to bring through crops on the most carelessly cultivated land, but, at odd intervals, we have seasons of rather scanty rainfall during which the crops of the careless cultivator go under, while those of the scientific, persistent cultivator survive and mature successfully. The careless cultivator may laugh at the trouble his more enlightened neighbour takes; but, nevertheless the extra cultivation be it before or after sowing is justified by results.

The difference in results in ordinary seasons may not be so pronounced as to be discerned by the untrained eye, but there is invariably a difference, and in a dry season the difference is so great sometimes as to mean in the one case failure and in the other success.

Dry farming, as generally understood, consists in artificially increasing the pore space in the soil as much as possible, in order to increase its water-holding capacity and to prevent the escape of the soil moisture by capillary attraction. Deep and thorough cultivation by various means provides for the former condition, and frequent light surface stirring provides for the latter by destroying the capillaries near the surface.

The mere moisture preservation is not the only result of all this repeated cultivation and, in fact, in most parts of the Protectorate this consideration would be considered one of minor importance compared with that of the releasing of plant food. Everyone knows that a stiff virgin soil takes a great amount of what is called "sweetening." This sweetening process can, with or without the aid of other means, such as the application of lime, be brought about by simple cultivation. Now, what exactly takes place during this process? In the virgin state, such a soil, however naturally rich, contains a very small amount of prepared or available plant food. The actual "sweetening" is the process which transform these inert supplies of plant food gradually into supplies immediately available to the plants. These changes are brought about by chemical and biological agencies, particulars of which need not be given here, the point being that cultivation by various means gradually tends to transform the inert plant food of an unworked soil into a form available to plants. For an ocular demonstration of this one has only to look at results of cultivation on the stiff black soils of the plains east of the Kikuyu Escarpment, which continue to improve in yielding capacity up to at least the twelfth crop.

The growing plant assimilates many substances from the soil, the most important among which are nitrogen, potash and phosphoric acid. These, along with the other minor substances necessary for the building up of the plant, are only assimilable when in a state of solution and, although a soil—such as a stiff virgin one—may contain large stores of these necessary substances, it may fail to produce crops simply because they are not soluble. Air, moisture and warmth are conducive to the working of the chemical and biological processes in the soil which make the dormant plant food available. Every practical farmer is cognisant of the manner in which virgin soils thus improve, although, perhaps, he may be ignorant of the actual agencies at work.

In newly broken soil the results of this improvement in supply of plant food are amply apparent to every one. We must realise, however, that these processes are not confined to virgin soils. They are proceeding to-day in the oldest cultivated soils of the world, and they are going on in every inch of our cultivated soil, be it newly broken up or soil which has been under cultivation for years. The farmer's aim should be to make the mechanical condition of his soil such as to encourage this process, so that when his young plant begins to take its nourishment from the soil there is plenty of food for it in a readily assimilable form. How can he best do this? The answer is simple. By the aeration which results from thorough cultivation. It must not be forgotten, however, that there are certain substances which alter the mechanical conditions of a soil and help chemical and bacterial action. These, of course, are used in conjunction with the stirring of the soil.

We see, therefore, that the processes in what has become known as dry farming are not only beneficial to the farm of scanty rainfall by preserving the necessary moisture in the soil for a crop, the predominant consideration there, but also to the farm having a plentiful supply of rain by making a reserve in the supply of available plant food upon which the growing plants can immediately draw. Now this point is of much interest to some of our farmers. It cannot be denied that it is possible to raise two crops yearly in almost any district of British East Africa; but is it advisable in all cases? On the red, friable, naturally well aerated soils of the Kikuyu country fallowing is a very expensive process, because of the very persistent weed growth. Moreover, the formation of available plant food apparently proceeds quickly enough to allow of growing successfully two crops yearly. On the other hand, however, on the heavier soils, such as those of some parts of the Athi Plains, conditions are very different. In such soils weed growth is by no means so vigorous, the cost of fallowing being as a consequence comparatively small, and the natural tenacity of the soil leads to anything but a quick forming of supplies of available plant food. It is such soils as these which will best repay the farmer for money and labour expended in the improved cultivation.

It is perhaps expecting too much of such stiff soils to produce two crops a year. When a crop is actually growing, a certain amount of surface cultivation can proceed, but this leads to the aeration of a very thin surface layer only. No sooner is one crop harvested than another is sown and the young plants up and searching for a plentiful supply of easily assimilable

food, which in such soils cannot be reasonably expected to be present; and we must remember that quick initial growth gives strength and vigour to the plant which enables it to stand against unfavourable conditions at a later period of growth.

Now, if such a soil were cropped once a year only, lying fallow, say, for seven months, during which scientific cultivation was proceeding, there would be a gradual accretion of available plant food and moisture which at sowing time would be readily assimilated by seedlings.

In proposing such a fallow, we must lay stress on the fact that it must be a well-worked and not a neglected fallow, for it has been demonstrated that the latter tends to give up almost as much moisture as soil on which a crop is growing and that the percentage of nitrates in a worked fallow is, at the end of four months, more than two-and-a-half times as much as that in an unworked one.

It must not be forgotten, however, that the treatment in a well-worked fallow may under certain conditions prove wasteful of the natural resources of the soil. Bare fallowing by continually drawing upon the dormant plant food is gradually lessening the natural resources of the soil and under certain conditions when a crop is not being actually raised quite an appreciable amount of the converted available food may go to waste.

It would seem that fallowing in our more friable soils in the districts having a good rainfall is an unnecessary proceeding, and in fact one which might lead to actual waste of the natural resources of the soil. On the other hand, the fallowing of the stiffer soils, so that one crop only is grown would appear to be beneficial to the farmer and fraught with very little risk of any wasteful actions taking place. Although fallowing may not always be advisable, good and persistent cultivation will certainly always repay the farmer.

Dry farming may become of more interest when closer settlement take place. The dry districts at present are suitable for sheep-farming, and sheep farmers do not want to grow crops. Some day, however, economic considerations may lead to the grazier being replaced by the dairyman and the wheat grower, as has happened elsewhere; and then dry farming will be a question of first importance.

Dry farming in any of our districts will always allow of the raising of at least one crop a year.—AGRICULTURAL JOURNAL OF BRITISH EAST AFRICA.

DRY FARMING IN AUSTRALIA.

"The practising of dry farming methods in Australia would, in districts of under thirty and over twenty inches of rainfall, increase the yield perhaps 25 per cent. or more, while in areas of under twenty inches, the increase would be in a much greater ratio." The observation is made by MR. N. NIELSEN—who was recently commissioned by the New South Wales Government to visit America—in his report on dry farming. "The Riverina farmers," he goes on, "have demonstrated that good returns can be secured

every year, and splendid ones in favourable years, while the years of extreme drought may be made much less baneful than they were under the old conditions. I feel quite sure of my ground in asserting that our wheat production in New South Wales can be increased by at least 50 per cent., and failures reduced to the lowest possible minimum by the general adoption of these methods."— UNITED EMPIRE.

THE EDITOR OF THE "TROPICAL AGRICULTURIST."

SIR,

I would ask the privilege of replying to the Hon'ble MR. H. R. FREEMAN upon the above subject.

MR. FREEMAN is labouring under many mistakes. The Jaffna tiller of the soil is not a "dry" farmer, but contrarily a "wet" farmer. MR. FREEMAN appears to labour under the impression that farming must employ either the primeval methods of flooding of the Sinhalese paddy grower, or that abundant rain is necessary. He ignores the fact that the Jaffanese employ water artificially. They raise it from wells and run it in channels. The heat occasioned by the sun's rays on the beds draws the water from the channels into the soil and raises it to the beds. It is the physical employment of the sun's rays. The method is common to the Australian Chinese vegetable growers and is termed "wet farming." It is not "dry" farming.

Dealing with his condemnation of the Wanni for the reason that it is malarious I would contend that unless brought under the plough it will remain so, but contrarily I will agree that if this dark jungle—breeding place of wild beasts and pestilence—is laid flat, and air and sunshine let into these dark places, fever and pestilence will be replaced by health and wealth.

MR. FREEMAN pays a poor compliment to the hardihood of British pioneers when he raises the argument of fear. I would further contend that the birth place of sickness and disease that invade our towns is that same jungle, and that once it is rased to the ground all Ceylon must benefit and the standard of health be raised beyond our dreams.

Your correspondent pronounces wheat as a "non-tropical product." I cannot agree. Queensland produces wheat in a zone with an average shade temperature of 122°F. It is the method of cultivation necessary to raise the crop that requires study. The lesser rain areas of Ceylon in my opinion are eminently suited to the cultivation of all cereals.

The hon'ble gentleman also raises an alarm in regard to wild beasts. If the land is opened the wild beasts must go. I fail to see any reason why they should not go. Good crops are of more utility than wild animals. I do not believe the pioneer will be very frightened of rogue elephants or cheetahs if he may carry a good rifle. The argument I would submit is one of moral courage, hardly within the sphere of a discussion on dry cultivation.

Perhaps MR. FREEMAN'S most interesting argument is that newly burnt jungle land is not fit for immediate cultivation. I must contrarily submit that experience has shown (in Australia) that the first crops are the best. That the ashes and fire are the sole requirements to a first crop. The ancient and primitive chenaing of land is the ruin of good land. Immediate high cultivation is the producer of good soils.

MR. FREEMAN then entirely eliminates the whole question of "dry" cultivation by contending that the abandoned tanks must be restored. He returns to "wet" cultivation and ignores "dry" entirely. But the very object of dry cultivation is to dispense with these very tanks which MR. FREEMAN pronounces as indispensable. The argument that the first steps must be "storage of water" is to entirely sweep away the fact that "dry" cultivation without artificial water is in actual practice in common use and a practical fact and no longer an experiment.

Another argument pressed by MR. FREEMAN is that roots must be eliminated before implements can be used. Here again he is entirely at fault. The employment of modern "stump jump" implements renders rooting unnecessary, and plow, cultivator, and drills pass over roots without injury to the implements. Lime rots out the roots and the implements turn up this decaying vegetation to the sterilizing affects of sun and heat as it rots.

The main features of MR. FREEMAN's argument is to ignore "dry" farming altogether and to focus his views upon "wet" farming, to ignore modern implements, to raise alarm of dangerous beasts and health.

My visit to the Wanni startled me. Where such jungle vegetation will grow uncultivated, anything will grow cultivated.

Without dry farming there would be no Australia, for the greatest phenomena of that vast continent is its lengthy droughts and lack of water ways. Yet it flourishes—and without tanks.

All soils are brought into use—yellow sands, clays, chocolate, and rich red loams. From Point Lewin and its seasonable and varying climate, from Tasmania and its seasonable cold, from icy Southern New Zealand to tropical Queensland the same vegetation is produced. Changes in methods of cultivation are alone necessary.

As an example I would call MR. FREEMAN's attention to Northam in West Australia. An average of 8 inches of rain ($6\frac{1}{2}$ is enough) in six weeks with a 46 weeks' drought produces as fine a crop of wheat as any part of Victoria or New Zealand or England. It grows during the tropical heat. It is planted in the so-called winter (about 76°F) and grows in the sun rays at 140°F.

Dry farming means capital outlay and cultivation on a large scale, and I unhesitatingly say that all the flat soils of Ceylon are most fit for the purpose, and that the extreme irrigation schemes now developing are unnecessary. I do not merely speak technically but from practical experience.

But I agree with MR. BEVEN that security of tenure of land and its acquirement on easy terms is essential. I do not agree with MR. FREEMAN that the land need be gifted, but I would venture to suggest that the authorities should fix a fair value payable over a number of years at a fair rate of interest. The land and all its improvements to be their mortgaged security.

Nor do I admit that the villager is the sole person to be considered. The development of Ceylon is the first consideration irrespective of persons and based upon sound development only. The risk of loss is the cultivators' and speculators' that is no concern of the authorities.

If MR. FREEMAN can obtain for me 1000 acres of land at a fair value on easy payment I undertake to find the capital to work it and undertake that the whole shall be cultivated under two years. Unlike MR. WINCHERLEY I ask for no special concession or favour clauses, I would promote no company. I ask for nothing but the land at fair value and on easy terms.

Whilst agreeing with MR. FREEMAN that the industry of the Jaffna tiller is worthy of great praise, yet I considered it was a sad sight to see the primitive methods by which he practised his cultivation. To see men on easily cultivatable lands straining with hoe and fork, wasting days and weeks over a small patch of ground that would take but a few hours under modern conditions, was to invite Biblical pictures to one's eyes, and to send one's mind into dreamland. That men should be wasted, time set at nought, and good labour for other purpose tied to the methods of the earliest of men is in my opinion an eye sore, and one that does not redound to the credit of British rule. It is not cultivation, it is gardening. To see the laborious watering and the energy wasted in well-sinking where neither well nor watering is necessary is but to invite a philosophy on the wrong kind of activity and industry employed.

If I may, I would venture to say that the crusade of "dry" cultivation is the greatest step in the right direction Ceylon has ever had and that it will open up the production of more necessary and staple products than those fancy products that Ceylon at present depends upon, and may establish Ceylon as one of those nations upon which the world depends for its necessities of life.

Yours faithfully,
D. M. WEIGEL.

Jesmond Dene, Colpetty, 24th Dec., 1913.

BELLADONNA IN INDIA.

The following report has been received from the Economic Botanist to the Botanical Survey of India, to whom sun-dried roots of *Atropa Belladonna*, grown at the Kutchery garden, Naini Tal, were submitted :—

" . . . The roots consisted of two kinds, viz., from one-year-old plants and from two-year-old plants, and were registered respectively No. 34375 and No. 34376. The alkaloid was estimated in each sample of root and it was found to occur to the extent of 0·4 per cent. in that from the one-year-old plants and 0·45 per cent. in that from the two-year-old plants. Belladonna roots obtained from Europe and used in British medicinal preparation contains from ·2 to ·6 per cent. of total alkaloids. The roots grown in Naini Tal are therefore of good average quality and are suitable for use in the medical store departments of India."

Considering the fact that the soil in which these plants were grown cannot by any means be regarded as good, the report that the roots are of good average quality is most encouraging, and fully justifies the experiments being made on a more extensive scale.

In better soil, which is easily obtainable in the Ramgarh neighbourhood I believe that far heavier yields and a considerably higher percentage of alkaloid will be obtained.

The Naini Tal results worked out as follows :—

Belladonna roots.—1 year old ...	3,570 lb. per acre	(alkaloid 0·4 per cent.)
do do 2 year old ...	3,545	(alkaloid 0·45 per cent.)

From the above it will be noticed that although the percentage of alkaloid was far greater in the two-year-old roots the quantity harvested was actually less. The reason for this I am unable at present to explain beyond the fact that it was probably due to the plants having been grown in poor soil.

A point that should not be lost sight of is the ease with which this drug can be grown and the imperviousness of the crop to insect pests and animal life. A good stock of acclimatized seed has been saved from both Naini Tal and Douglas Dale grown plants. The roots of the Douglas Dale grown plants rot during the rains, but seed, which is of a lighter colour than that produced in Naini Tal, has been saved.

Belladonna root is at present obtained from England by the Medical Stores department at a cost of about four pence per pound, so that there is every prospect of Belladonna being grown profitably in Kumaun.—ANNUAL REPORTS, KUMAUN GOVERNMENT GARDENS.

FRUITS.

HANDLING AND STORING BANANAS.

The following report describes the methods adopted for handling and storing shipments of bananas which arrive at Garston, near Liverpool, England:—

The NORTH-WESTERN RAILWAY CO., the owners of the docks at Garston, have every appliance there for dealing with the despatch with the bananas as they arrive. As soon as the ship comes alongside the dock, large canvas elevators, each operated separately by its own electric motor, are wheeled along the quay and one dropped into each hatch. Each elevator is continuous, having two legs and a flat top. These conveyors have large canvas pouches, into each of which a bunch of bananas is put, and carried up to the top of the hatch, across the deck and down the other leg on to the quay wall.

As the bunches arrive just above the level of the wall, they are tipped, one by one, on to a long continuous conveyor band, also worked by its own electric motor, and carried along until they come opposite the door of the particular railway waggon which is being loaded. Here each bunch is taken off separately and carried two or three yards to the closed railway truck, where it is stacked on end surrounded with a very plentiful supply of straw. Those bananas that have become detached from the bunches in the conveyors or elevators are not packed in the railway van or sent to the sheds, but are carried along until they arrive at the end of the long straight conveyor on the dock side where they fall into baskets, and are sold to a contractor who agrees to buy all the loose fruit there may be.

Many thousands of bunches are sent direct to Hull for the Continent; these are packed in trucks with special inner casings, which can be lifted out of the outer trucks by means of a crane, and put on board the continental boat without disturbing the bunches themselves.

At Garston there are facilities for dealing with 55,000 bunches in eight hours, that is to say, this quantity can be unloaded from the ship and sent away by rail or packed in the storing sheds in this time, which includes meal hours.

The storage rooms in the sheds are built on each side of central passages. The rooms have concrete floors, sprinkled with saw-dust, and wooden walls and roofs. The rooms are about 7ft. 6 ins. high and are heated by a large number of Bunsen burners placed round the walls, and about 18 inches from the floor. A room about 14 yards long by 10 yards wide contained ten burners. At each side of the door on the floor level there is a ventilating grid to admit air from the central passage way. These grids are about 18 inches square and are opened and closed on the outside by sliding shutters. At two places in the centre of the roof are ventilating shafts about 5 inches

NEW INDIAN MANGO FRUITING AT VEYANGODA.

by 9 inches wide which can be opened or closed by means of a flap. These ventilating shafts connect with the main air trunk, which is exhausted if necessary by means of an electric fan.

At distances of 12 inches pieces of rough twine hang from the ceiling and alongside each piece of twine there is a hook which enables each bunch, as it is brought up, to be tied up very expeditiously.

On one wall of each room there is a thermometer marked with the following readings :—

75° too hot
72° quick ripening
66° medium ripening
60° slow ripening
56° to keep
50° too cold.

As a matter of fact I find that there has been so far very little storage indeed done in these sheds, as the consignees have shipped away the bunches immediately they arrived, to different parts of the country and the Continent —BULLETIN No. 74, AGRICULTURAL DEPARTMENT OF TRINIDAD AND TOBAGO.

ROYAL BOTANIC GARDENS, PERADENIYA.

Visitors to the Royal Botanic Gardens for September, October and November numbered 1,566; 2,819 and 2,576 respectively.

OXALIS WEED.

The experiments made with a view to exterminating the Oxalis pest in the upper portion of the garden have been attended with more or less success. A crop of rice followed by barley and wheat considerably cleared the ground of this baneful weed, and at the time of writing scarcely a single plant can be seen; it may however possibly re-appear with the advent of the rains. Further cropping will not be advisable, as it will interfere with the growth of the young orange trees which have been planted in this spot.—ANNUAL REPORTS, KUMAUN GOVERNMENT GARDENS.

MANURES.

THE CHOICE OF MANURES.

The principles which guide the practical man in his choice of manures and fertilizers are simple and well known. In the first place the growing plant requires large quantities of water, if only to repair the inevitable and continuous loss of water vapour from the leaves. The plant itself contains an extraordinarily large percentage of water, and all the chemical operations which take place in it depend for their fulfilment on a larger or smaller quantity of water in the tissues of the plant. Hence if he is to obtain larger crops the gardener must see to it that an adequate supply of water is available to the plant. It is not enough for him—even where it is practicable—to add water: he must build up a soil of such constitution that it will both hold water and part with it readily to the plant. Since decaying organic matter, farmyard manure, for example, imparts this property to the soil, this class of substance is looked upon as an ideal manure.

In the second place, the practice of manuring depends on the well-established fact that certain mineral substances, and particularly nitrogen compounds, potash and phosphoric acid, are essential plant foods. Hence the art of manuring consists in the amelioration of the water conditions of the soil and in supplying deficiencies in what may be called the feeding capacity of the soil. There is, however, a third principle, which is no less important, but which is apt to be overlooked. That principle is an economic one. The gardener must secure the conditions which we have indicated at the minimum of cost.

By the addition of dung in sufficiently large quantities an adequate amount of essential food may be provided; but since dung contains relatively small quantities of such an essential as phosphoric acid it is evident that a more economical method of manuring consists in adding, together with a smaller amount of dung, some phosphatic fertilizer, such, for example, as basic slag.

In recent years these old-established principles have been challenged, and we have been asked to revise the articles which constitute this philosophy of manuring.

The new philosophy, which has been used by MESSRS. WHITNEY and CAMERON, of the Bureau of soils, * holds that all soils contain large stores of the essential foods, phosphates and potash, that the water in the soil—the soil solution—contains enough of these substances for the purpose of plant growth, and that one soil is not more fertile than another because it is richer in such mineral substances as potash or phosphates, but primarily because it is in better case to supply the crop with all the water which it requires. A

* U.S. Department of Agriculture.

second cause of the inferior fertility of certain soils is found by MESSRS. WHITNEY and CAMERON to lie in the existence therein of toxic substances produced by the roots of previous crops, and left in the soil to the detriment of the growth of the plants which succeed these crops.

In order to meet the objection that artificial potash and phosphatic manures are known to increase soil fertility these investigators urge that the fertilizers act, not by supplying food to the plant, but by putting the toxic soil-substances out of action.

From the point of view of immediate practice the newer hypothesis is not important; but from that of the ultimate practice of manuring no less than from the point of view of scientific horticulture it is of very great importance indeed. Hence the investigations carried out by MR. A. D. HALL and his colleagues at Rothamsted, and published recently by the Royal Society, * are particularly opportune.

The net result of these investigations is to vindicate the older view, and to show that the revolutionary toxic hypothesis is without foundation. The conclusions reached by MR. HALL, which are of greatest interest, are, first, that the Rothamsted plots, which are to-day producing poor crops owing to the fact that essential foods—now potash, now phosphoric acid—have been withheld during the past 60 years, yield good crops when their particular deficiencies are made good. Thus a phosphorus-starved soil gives a normal good crop when phosphatic manures are added to it and similarly a potash starved soil recovers its fertility when its defect of potash is made good.

Second, although the soil of such plots has carried continuously for the past 60 years crops of one kind only—wheat in some cases, barley in others—water extracts from the soil are found to have no toxic action whatever on the roots of similar or different plants.

Hence the toxic theory of soil-fertility may be dismissed, or at most regarded as of very limited applicability.

Third, the WHITNEY-CAMERON hypothesis that all soils contain enough potash and phosphates for plant-feeding purposes is shown to be improbable. For HALL demonstrates that, as we might expect on the old view, the feeding value of a soil-extract increases within the wide limits with its concentration. That is to say, a solution which contains more potash or phosphates produces bigger crops than one which contains less of the substances. Naturally, there is a limit to this law that concentration increases crop, and, as we all know, an excess of soluble fertilizer may result in no crop at all. The rôle, therefore, of the artificial fertilizer is to bring the "soil solution" up to the maximum beneficent concentration, and we may still hold the common sense view that fertilizers used as supplements to dung exert their beneficial effects by reason of the plentiful supplies of specific foods which they put at the disposal of the plant.—GARDENERS' CHRONICLE.

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* *Phil. Trans. Roy. Soc.*, London, 1913.

A GREEN MANURE AND WEED PREVENTIVE.

A. STOLZ AND H. HARMS.

Desmodium hirtum is an additon to the number of nitrogen-bringing green manure plants, which grow rapidly forming a dense cover, capable of preventing the development of weeds and of protecting the soil against leaching out by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. etc Perr.) is fairly extensive. It is found in Natal, German East Africa, Senegambia, Sierra Leone, Togo and Kamerun. It grows from sea level up to an elevation of about 5,600 feet. It is a herbaceous climbing plant, the branches attaining a length of 3 feet to 6 feet. In German East Africa the plant loses its leaves in July and August and many of the branches die, but in September vegetation starts again, new branches cover those that have died and which go to form an excellent humus.

The production of the seeds is not very easy, consequently the writers recommend the following method. The seeds are sown in a rich loose fresh soil; the seedlings are transplanted when about 4 inches high into loose soil. Thus vigorous plants are obtained which produce numerous cuttings The writers insist on the necessity of taking only rooted cuttings, and they advise choosing a rainy season for making a plantation and setting the plants 3 feet apart.

The *Desmodium* is very sensible to the physical state of the soil; it has a decided preference for tilled soils and develops much more in plantations than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep which completely prevents the growth of weeds and thus allows a great economy of hoeing; besides this, *Desmodium* may be utilized as green manure and as food for live stock, sheep and asses being especially fond of it.—MONTHLY BULLETIN.

DIFFERENT PHOSPHATIC MANURES.

The following account summarised from the Northumberland County Education Committee Guide to Agriculture, Experiment Station, Cockle Park, appears in the JOURNAL OF THE BOARD OF AGRICULTURE FOR NOVEMBER:—

A test of the relative values of phosphatic manures was commenced in November, 1911, when plots 1/20th acre in area were laid down on young

three years' "seeds" after barley. The dressings each of which supplied 200 lb. of phosphoric acid per acre, and the yield of hay in 1912 were as follows :—

	Weight of Hay, 1912. cwt.
Plot 1.—9½ cwt. basic slag, 41·3 per cent. phosphate of lime, 89 per cent. citric soluble, fineness 90 per cent., supplying 458 lb. lime per acre	35¼
Plot 2.—19·7 cwt. basic slag, 19·82 per cent. phosphate of lime, 66 per cent. citric soluble, fineness 95 per cent., supplying 892 lb. lime per acre	39¼
Plot 3.—8½ cwt. bone meal, 46·64 per cent., phosphate of lime, mostly citric soluble; 4·78 per cent. nitrogen; supplying 269 lb. lime per acre	33¾
Plot 4.—No dressing	33¾
Plot 5.—8·6 cwt. Tunisian rock phosphate (ground) 45·3 per cent. phosphate of lime (trace citric soluble), fineness 100 per cent., supplying 426 lb. lime per acre	35¼
Plot 6.—8¼ cwt. Belgian rock phosphate (ground) 47·2 per cent. phosphate of lime (trace citric soluble) fineness 98 per cent., supplying 453 lb. lime per acre	35¼
Plot 7.—16½ cwt. Belgian rock phosphate (calcined), 24 per cent. phosphate of lime (trace citric soluble) fineness 100 per cent. supplying 1,114 lb. lime per acre	38½
Plot 8.—4⅛ cwt. Belgian rock phosphate (ground) 47·2 per cent. phosphate of lime and 6½ cwt. superphosphate, 29·9 per cent. soluble phosphate of lime (100 lb. phosphoric acid)	37¾

It will be seen that the slag applied to Plot 2, which was only of 66 per cent. citric solubility, has so far given a larger return than the 89 per cent. citric soluble slag applied to Plot 1. The results indicate that a high citric soluble slag is not necessarily quicker in its action than one of low citric solubility, and that a high content of lime in slags is advantageous. It is stated that a high-grade slag of normal citric solubility, as a rule, costs less per unit of phosphate of lime, and on the whole has given the best economic returns. Mineral phosphates appear to be deserving of more attention from the experimenter and farmer. Their cost per unit of phosphate of lime is now considerably less than that of basic slag. It is concluded that for three years' seeds there are indications that the same amount of phosphate applied in the form of a mixture of basic slag and superphosphate may give better results than when all the phosphate is applied in the form of slag.

THE DOMINIONS.

COFFEE IN EAST AFRICA.

The following extract is from a lecture by MR. J. G. HAMILTON published in the Proceedings of the United Planters' Association of Southern India, 1913:—

The climate of Nairobi was like that of Coonoor at its best. There were two rainy seasons there, the long rains and the short rains. The local rainfall averaged from 40 to 50 inches in the year, but the year he was there the rainfall was 60 inches, so everything was very green. What principally interested him in Nairobi was coffee. He saw several estates and he saw coffee which he did not think existed anywhere else in this world. The coffee was planted at various distances till they came down to 8 ft. by 8 ft. They topped the trees at 5 ft. and the coffee bush then assumed a pyramidal form, with the branches almost meeting at the bottom, although there was room to walk between the trees. He saw no trace of disease at all, but every branch from stem to tip was covered with crop. The man who took him round, as a so-called authority, asked him to estimate the crop. At the particular part of the estate he saw he put the crop at 2 tons per acre, and the whole (old and young) at 10 cwt., but the Manager wrote and told him afterwards that he had picked 35 tons from 55 acres. The coffee was all grown in the open and there was not a vacancy. There was no jungle, nothing but grass and undergrowth. Felling consisted in throwing a match down! After that the land was ploughed and a cooly was sent out with a crowbar and told to plant. Lining was done and well done ; the easy slopes presented small difficulties regarding this. The plants were put in along with Indian corn or beans, and a cultivator was run up and down to keep the weeds down. The Indian corn, or mealies, and beans got ahead of the coffee. When he saw a planting of this kind, he could not see the coffee ; it was smothered in Indian corn and beans. He never saw such magnificent crops of mealies. After they got this crop cleared, the coffee was seen from 18 inches to 2 feet high. He saw a crop of two-year old coffee which was said to be from imported Blue Mountain seed. The ordinary coffee cropped in two years, but the trees were not considered to be in full bearing till they were three years old when they gave a crop up to 8 cwt. per acre. The original seed was said to have been brought from Mocha ; but he could not trace it. It was said that one of the priests of the Mission had sent the seed from Aden. The oldest coffee is at the French Mission (Society of the Holy Ghost). He had brought away some seed and had now got plants from it, and the leaves had that curious crinkly look he had seen on coffee which a Mohamedan told him had been brought from Mocha. As regards the vegetation, they had a certain amount of green stuff, but not many leguminous plants, as far as he could see and recognise. It was just ordinary green stuff ; but the soil was a rich loam ot which he could not find the bottom anywhere.

He had a letter from a man in Mysore who went to Nairobi, saying that small silver oaks planted round the house in December were from 6 ft. to 10 ft. high in the following July. He did not think that anywhere in India it was possible to find growth of this kind. The roads were not good: it was a new country, and they could not spend much on the roads, which were more like bridle-paths. There were not many carts, and the people generally went about in mule buggies or rickshaws. Cattle could be kept if one was careful, but horses were difficult to keep. Some men rode mules, but a great many bicycles were also in use. It was very evident from the look of the children that the climate was very fine, and the children went about in the day just as children did at Home. The labour was there in any quantity, but the people did not want to work, as there was no need for them to work. Every man had two or three wives, and they scratched the ground, threw down a handful of Indian corn and their food supply was assured. They were very simple livers, subsisting mainly on mealies and a kind of sweet potato. Some settlers went in for farming and sheep and cattle; but sheep stealing was very rife, as all knew from one notorious case that they had read of in the papers. Transport was expensive and difficult, and railway freights were high. Carting was decidedly expensive with roads that were as bad as he had described.

CATTLE BREEDING IN GERMAN EAST AFRICA.

G. LICHTENHELD.

The 2,300,000 head of cattle in German East Africa are very unequally distributed. About one-third of the Protectorate is unsuitable for cattle owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Europe, are zebus. They mostly belong to *Bos zebu africanus*, but some are *B. Z. indicus* (called Sokotra cattle by the writer). Among the African zebus, the writer draws a distinction between those with large horns and small humps (Watussi, numbering 750,000) and those with small horns and large humps (Masia, 1,500,000).

THE MASAI ZEBUS.

Bred chiefly by the Masai tribe. Colour usually red or yellow and brown but frequently black or white and grey. Pigmentation generally dark, rarely similar to the coat colour. Skin thick and coarse; hair smooth, short, with a silky lustre. Head small, often hornless, but frequently with short, stout horns bent slightly upwards. Face slightly dished. Ears medium sized, directed sideways and slightly backwards. Neck of medium length, with the dewlap usually more developed. Withers wide, hump 12 inches high, and usually more developed in the male than in the female. Shoulders sloping and muscular. Chest relatively deep, occasionally somewhat flat. Body barrel shaped. Back and loins of medium length and in a straight line. Croup weak and sloping. Haunches very fleshy. Limbs short, but with small, regular bones. The legs are sometimes crooked but to no great

extent. Tail set on rather low, long and thin, with a large tuft. Hoofs small, hard and varying in colour from grey to black. Udder small, fleshy, almost hairless, with short, fleshy teats. The size of the animals varies in different localities and attains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 5 ft. or 5 ft. 6 in., in height. The best developed animals are usually found in the hot dry district, while the less developed occupy the lower ground.

The Masai zebu matures late ; cows do not come into heat until the age of $2\frac{1}{2}$ years. The bulls and cows are full grown between $3\frac{1}{2}$ and $4\frac{1}{2}$ years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather and disease. The calves are subject to Texas fever, which is prevalent throughout the Protectorate and causes 1 per cent. loss, if the animals contract it during the first months of their life. If the disease appears later, the losses can amount to 20 per cent. or over. The same occurs in the case of anaplasmosis. Coast fever, in the districts where it is endemic, is responsible on an average for the death of 30 per cent. of the calves; the remainder enjoy life-long immunity; but if this disease is introduced into a hitherto healthy herd, it may carry off 90 per cent. The number of cattle attacked by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually normal, no assistance being needed, and it is followed by no bad after effects. The milk production is normally below 70 gallons per lactation period, but under favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lb.; steers of five years of age give up to 440 lb. of beef, and those of 7 years up to 770 lb. The weight of the hump can attain 24 lb. The meat contains coarse fibres and is less marbled than that of European breeds. The fat accumulates chiefly below the skin and round the viscera. These zebus are satisfactory draught animals.

THE WATUSSI ZEBUS.

These are only bred by the Watussi tribe, and are a little smaller than the previously mentioned animals. Coat usually red, brown or yellow. Head and horns longer than in the Masai type. Chest deep, but flat. Line of back and croup straight. Legs often crooked. Milk production twice as large as in the case of the Masai type, but meat production poorer. The animals are less resistant to epidemics and other forms of disease than the Masai zebus; they cannot stand short rations or want of water as well as the latter. These faults recur in crosses between the two types. The Watussi are also less fertile and develop later than the Masai zebus.

THE SOKOTRA ZEBUS.

These were introduced direct from India by merchants and are much appreciated for their good milking qualities. They are especially suited to the coast zone, and will, in the opinion of the writer, be still more popular in the future.

CATTLE KEEPING AND BREEDING BY THE NATIVES.

Most of the tribes keep their cattle in the open, but some give them shelter at night. The calves are only put with their mothers for suckling.

As the natives milk all the cows the calves generally suffer from underfeeding. The large and the small domestic animals do not graze together. During the rainy season, and for a short time after the animals are at grass for some hours; during the dry season, they remain in the field all day. When the natural supplies of water are exhausted, the natives dig wells to obtain drinkable water.

In some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow-house. The natives have no idea of making hay, or of storing fodder for times of dearth. When the grass of a pasture becomes scanty, the native sets forth in search of fresh fields, or sends some of his cattle into good grazing districts, paying in return for the pasturage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are generally chosen for shape, colour and maternal descent, the offspring of good milkers being given the preference. Unsuitable animals are castrated. The proportion of bulls ready for service is about 1 to every 20 cows. The cows are chosen for their good milking properties. A well-proportioned milch cow may be worth as much as three bullocks. As the natives use all their cows for breeding the herds become very heterogeneous. According to the writer, there is no selection of cows for breeding, for the idea is to use all the available animals, and thus increase the size of the herds as much as possible. In order to avoid in-breeding, the native exchanges his breeding animals with those of other cattle owners. The Masai zebus are often crossed with the Watussi, but the offspring produced by crossing these two types with the Sokotra zebu enjoy equal favour. Most of the native tribes still refuse to introduce into their herds European cattle or their hybrids.

CATTLE KEEPING AND BREEDING BY EUROPEANS.

The methods adopted by the Europeans differ little from those which obtain amongst the natives. The chief aim of the European breeders is to have as large herds as possible. As a rule, their herds are less valuable than those of the natives, which is the more to be regretted as they import many bulls from Europe. The writer thinks that it would be best for the European graziers to begin improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resisting the climate and the diseases peculiar to the country. It is true that some success has been attained recently in rendering European cattle immune from the most serious diseases, such as anaplasmosis and Texas fever, but for various reasons, immunisation cannot be practised generally. European cattle if introduced should, according to the writer, be kept in the cowshed.

Alongside of ordinary farms, where, as on those belonging to the natives, the chief attention is paid to meat production, there are also some dairy farms in the Protectorate. The milch cows on these farms are Sokotras or of European breeds; they are always kept in the stall, and receive in addition to grass and hay "mogo" * and oil cakes.

* This is a tuber of which the feeding value is about equal to that of the potato.

THE VALUE AND IMPORTANCE OF THE CATTLE.

The price of a steer yielding 440 lb. of beef varies from 25*s* to 90*s* according to locality. Cows fetch a quarter or half as much again.

At Daressalam a gallon of milk costs 2*s*; at other places its price is from 2½*d* to 10*d*. One pound of fresh butter costs about 3*s* at Daressalam; 1*s*. 6*d* at Moschi; 11*d* at Iringa. One pound of "samli" † costs 3*d* at the chief places of export.

Until lately, the cattle of German East Africa have been chiefly important as providing food for the native breeder, whose prosperity depends for the most part upon his herds. Recently, however, they have also begun to supply the plantation workers and the town populations. Last year, about 12,000 oxen were sent for slaughter to the districts of Tanga and Wilhelmstal. On the other hand, the writer estimates the number of animals which annually find their way to the market at over 40,000. Considering the small amount of business, and the low price of meat, there is no question of the rational utilization of the cattle. In all breeding districts the over-production of beef producing animals is noticed. The writer considers that the best means of preventing a crisis in this direction would be the establishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 1910, 240 in 1911, and 179 during the first half of 1912. As regards "samli," 677,300 lb. were exported in 1910, 659,500 lb. in 1911, and 399,600 lb. during the first half of 1912.

The duty on exported cattle amounted to about £17,000 in 1910 and 1911, and £10,350 during the first half of 1912. The small numbers exported are partly due to the prohibition of the importation of cattle into the neighbouring colonies (except Zanzibar and the Congo) and the law forbidding cows being exported from the Protectorate. As draught animals and producers of manure, the cattle in question are of no interest.

METHODS OF IMPROVING CATTLE BREEDING.

The writer is of opinion that it would be worth while to improve the breeds of cattle in German East Africa. In order to do this it would be necessary to improve the management of the animals, abandon the practices which lead to the under-feeding of the calves, not allow the heifers to be served by the bull at such an early age, and diminish the size of the herds kept in districts poor in forage. Hay should also be grown on the farms kept by Europeans, and maize, potatoes, lucerne, etc., cultivated on dairy farms. A better selection of stud animals is very desirable; in-breeding should be avoided, and only immune bulls used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the purpose of improving the milk production, and considers that such crossing should be practised by the European farmers exclusively.—MONTHLY BULLETIN.

† Native-made melted butter.

OLIVE GROWING IN ITALY.

PROF. F. BRACCI.

From the most remote antiquity the cultivation of the olive has been very important in Italy.

The special conformation of the country, its position in the basin of the Mediterranean, that is in the centre of the habitat of the olive, the mildness of its climate and the fertility of its soil, render the peninsula very favourable to the growth and productiveness of this oil plant. It is not certain whether Italy or Spain occupies the first place for extent of area under olives and for quantity of oil produced. Whilst the sources of Spanish statistics are liable to discussion, in Italy at present a different system is followed in the valuation of the area under olives, a distinction being made between the area devoted exclusively to olive trees and that which these trees share with other crops. Thus comparison between the two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system give the following figures for the acreage under olives:

	Acres.
Average between 1870 and 1874 ...	2,210,650
,, ,, 1879 ,, 1883 ...	2,294,630
,, ,, 1890 ,, 1895 ...	2,663,538
,, ,, 1901 ,, 1908 ...	2,705,428

With the new system the figures are:

Average between 1909 and 1912	Acres.
Olive trees intermingled with other crops ...	4,358,562
Olive trees alone	2,353,560

Considering the figures according to the new system to be correct, it appears that the area estimated at 2,705,428 acres was in reality 3,423,420 acres.

Though we may not infer that the area occupied by the olive has risen from 2,210,650 acres in 1870 to the present 3,423,420 acres, as the latter figure may be, and probably is, due to greater accuracy or at any rate to a different method of estimating the area, there are in reality grounds for believing that the area under olive trees has sensibly gained in extent, as a fair number of new plantations are to be seen, mostly better set out than the older ones. There was, however, a short period after 1880 during which many olive groves were destroyed to make way for vineyards; this took place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the present time.

Taking into consideration large averages, we get, up to 1908, that is up to the new statistics, the following figures for olive oil:

	Gallons.
Period between 1870 and 1883 ...	73,843,000
,, ,, 1885 ,, 1896 ...	53,663,500
,, ,, 1897 ,, 1908 ...	45,988,800

According to recent statistics the average from 1909 to 1912 was 40,282,000 gallons; but perhaps 50,025,800 gallons would be nearer the mark, as it would include the residual oil (including "olio lavato," extracted from the pomace by washing; "olio d'inferno," collected from the well under the presses; and that obtained by treatment with carbon bisulphide).* For comparison with the returns of the older statistics the figure of 43,956,000 gallons should be taken, as it includes only the "inferno" oil. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of this crop during the last thirty years are many and of various kinds, namely: weather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889; it appears that during these 25 years drought and sirocco caused more or less injury in 21 cases; winter frosts and cold springs, and mists and rain that injured the flowering, in 7 cases; the olive fly caused serious and general injury in 10 cases; lesser or partial damage, together with *Rhynchites* and *Phlæothrips* and other insects in 7 cases; *Cycloconium* caused partial injury from the year 1902 onwards and since 1910 with increasing gravity and in almost all the growing districts. From the above it is seen that the most efficient cause of injury is the almost constant drought, which is easy to understand if one remembers that the olive tree grows mostly on hills and mountain slopes and most frequently without the necessary work being done to retain the rainwater, while the olive tree requires a good deal of moisture, which, as Giglioli says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the olive fly and other animals or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees.—MONTHLY BULLETIN.

BANANAS IN JAMAICA.

According to the WEST INDIA COMMITTEE CIRCULAR of October 7th the exports of bananas from Jamaica have now reached the total of 20 million bunches a year, and there are indications that the industry will expand still further in the near future. The railway extension in the Rio Minho valley is expected to open up some 17,000 acres well suited for bananas. In the North the United Fruit Co. are extending their plantations.

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* Whilst in the old statistics the quantity of oil was ascertained directly from that obtained during the season in each commune, with the new system the quantity of olives is recorded and the quantity of oil is calculated according to the average yield in the mill in the various districts. This yield does not include the "inferno" oil, nor that obtained by washing or treating with carbon bisulphide, though these oils also are put upon the market; the first of these oils is used to a great extent as food by the poor, who often prefer it to the better oils; it is also used, as well as that obtained by washing and by treatment with bisulphide, in the industries. The "inferno" oil may be calculated at about 1·5 per cent. and the other two oils at 2·5 per cent. of the crushed olives.

ENTOMOLOGY.

INSECTS ON RUBBER IN 1913.

Hevea brasiliensis. Muell. Arg. (Para Rubber).

In August a Cerambycid beetle was sent in from Kandy District. It was reported to be attacking rubber stumps planted the previous month by gnawing the bark. It had chiefly attacked the withered stumps that were not likely to grow, but had also been found on healthy stumps.

As the result of several experiments with the beetles sent I conclude that, while undoubtedly these beetles are able to eat the bark with impunity in spite of the flow of latex, they do not take it by preference e.g., when dry twigs are presented to them at the same time.

The beetle is known as *Mœchotypa verrucicollis.* Gahan

It is about 1 inch long, of a reddish-purple colour with a greyish area in the form of an X on the elytra.

The ventral surface is pinkish. The antennæ reach beyond the apex of the abdomen.

We have records of this beetle on Hevea from Matale and Ukuwela.

It was last reported in 1907.

The trees being attacked should be sprayed with lead arsenate.

Saissetia nigra Nietner (*Lecanium nigrum*) "Black Scale," which has been sent in several times, occurs widely on Hevea in Ceylon. It feeds on the leaves and twigs and is frequently attended by the large red ant, *Oecophylla smaragdina*, which often draws the leaves together to form a shelter over the scales.

There is a disposition to regard it as negligible as a pest, but this seems to the writer to be a mistaken attitude.

S. nigra is a serious pest of cotton in the West Indies, and in Ceylon occurs in injurious numbers on cotton and *Croton Tiglium.*

That scale insects are able to subsist on latex-fortified trees is proved by the fact that *Coccus viridis* Gr. occurs in injurious numbers on the leaves of *Funtumia elastica*, *Plumeria sp.* *Landolphia Kirkii* and *Alstonia scholaris*, as well as by the fact that *S. nigra* itself flourishes on *Hevea brasiliensis* and *Manihot glaziovii.*

S. nigra in Ceylon is not so subject to the attacks of hymenopterous parasites as are some allied scale insects, though the writer has reared several specimens of what is very probably *Scutellista cyanea* from the scales on *Croton Tiglium*, and has observed that the eggs are subject to the depredations of a Cecidomyid larva.

All things considered no chances should be taken of *S. nigra* not becoming a serious pest of Hevea, and it should be destroyed whenever an opportunity presents itself.

In all likelihood the ant keeps away parasites and war should be waged against it. It is often a perfect nuisance on tea and fruit trees in many parts of Ceylon. The nests should be broken up and sprayed with Kerosene Emulsion.

Phorids were found to have laid their eggs on decomposing, smoke-cured rubber, and the maggots were feeding on the products of decomposition.

The puparia of these flies are brown, oval, slightly convex on the upper and highly convex, almost ridged, on the lower surface. The dorsum is ridged transversely. The posterior end is truncate and bears four, small-pointed tubercles, the outer two of which are the largest. They vary in size from 3 to 4 m.m.

The adults are small, active flies.

They are yellowish-brown in colour, with seven transverse black bands on the abdomen; of those bands the most anterior is very narrow, the next is attenuated in the middle line, the two succeeding have a round, light-brown spot in the middle line, the next is almost obsolete in the middle line.

The legs are whitish-yellow.

The wings have some stout veins near the costal margin and other weaker ones extending across the wing and unconnected by cross veins.

Probably the rubber had been insufficiently dried. It had developed a mould.

Phorids generally lay their eggs in decomposing organic matter.

I have bred them from caterpillars and locusts that had died but a short time previously, and also from the combs of a wasp's nest, in the latter case in such circumstances as to suggest that the eggs had been laid while the combs were still in the soil.

But Phorids have so strong a sense of the proximity of decaying organic matter, and are so insinuating, that it is just possible the combs were infested after they had been gathered.

A large weevil, as yet undetermined, was sent in with the information that it was taken from a rubber tree (Hevea?) infected with canker.

FUNTUMIA ELASTICA.

Caprinia conchylalis. Guen.

On October 10th the caterpillars of this Pyralid were found feeding on the leaves of *Funtumia elastica* near Peradeniya.

They were living below a folded-over part of the leaf and were eating the epidermis. The shelter was at the tip of the leaf and was formed by a cut having been made from one side to the midrib, and the part thus set free having been folded over on to the corresponding part on the other side of the midrib and held in place by strands of silk.

The tents are not necessarily of the above type.

The two edges may be folded together along the whole length of the leaf, enclosing the upper surface of the leaf.

In October only a few leaves of the trees were attacked.

By November 6th, the trees were heavily infested and had a withered appearance due to the dead leaves.

On December 6th only a few withered leaves remained on the tree, and neighbouring trees of Funtumia, that had up till then remained almost free

from attack, shewing that the moths do not go far from their place of hatching, were beginning to shew here and there a withered leaf.

It afforded a splendid object lesson of the consequence of neglecting the first stages of an attack.

Had a thorough spraying with Arsenate of Lead at a strength of 5 lb. to 100 gallons of water been undertaken the outbreak would probably have been arrested.

The caterpillar is a beautiful one.

The body has a silky lustre due to a sticky fluid which the caterpillar secretes.

There is a brown, mid-dorsal stripe regularly spotted with white and bordered by a black stripe enclosing within its bounds ten white spots.

Below this the body is yellowish with faint white spots. The head and first thoracic segment are glossy black.

Long, white hairs spring from tubercles.

The head is tubercled and possesses a comparatively deep, median groove.

The hooks of the prolegs, which are of the usual number, are in a ring interrupted on the outer margin.

In older caterpillars ($1\frac{1}{2}$ inch in length) the black band bordering the brown dorsal stripe may become much fainter, so that the black tubercles in the area between the dorsal stripe and the black band become more obvious.

From larvæ that pupated on the 18th, adults emerged on the 27th.

The pupæ are usually to be found within the folded leaves, but they may occur exposed on the leaves.

The pupa is yellowish-white except the latero-dorsal region of the abdomen which is purplish-brown; this darker coloured region encloses triangular, yellowish-white areas near its lower edge.

There is a short snout.

The cremaster is situated at the end of a comparatively long, narrow process. The wing-sheaths and proboscis-sheath are free at the tip.

The moth has an expanse of 40-46 m. m.

HAMPSON describes it as follows:

"Pure white (it is purplish by reflected light when fresh); head black-brown, the palpi with a metallic tinge; collar, fore and mid legs tinged with cupreous brown; anal tuft of male black. Fore wing with broad, costal, cupreous-brown band; both wings with series of silvery striae close to the margin, which is silvery white."

He gives the distribution as Sikhim, Assam, Bombay, Nilgiris, Ceylon, Burma.

GREEN records the larva as feeding on *Portlandia grandiflora* and *Holarrhena mitis* Br. (*Kiri-walla*).

Neighbouring trees of Funtumia were infested with *Coccus viridis*, and the leaves were covered with sooty mould.

An undetermined Pyralid larva was feeding on the scales, and they were also attacked by a grayish-black fungus.

The trees, which in September and October were swarming with flies feeding on the "honey-dew" excreted by the Coccid, were almost deserted in November.

CAPITAL.

The total amount of capital required to establish a poultry plant of this size is from £25 to £30. The whole of the appliances need not be purchased at the outset, but may be obtained gradually as the stock increases, and all will be required by the end of October; produce will be sold from the commencement of operations, and by the time the whole expenditure is needed, sufficient should have been realised to meet it.

RECORD OF THE NUMBER OF BIRDS IN STOCK AND EGGS LAID FOR EACH MONTH FROM APRIL, 1912, TO MARCH, 1913.

1912.	Cockerels.	Pullets 1911 hatched.	Chickens.	Sales.	No. of eggs laid.
April ...	2	26	29	—	522
May ...	2	26	29 66	—	386
June ...	2	26	95 9	—	373
July ...	2	26	104 2	2	360
August ...	2	26 3	102 24	27	324
September ...	2	23	78 16	16	188
October ...	2	23	62 7	7	49
November ...	2	23	55 2	2	130
December ...	2	23 1912 hatched 53	53* —	—	431
1913.					
January ...	2	76 9	—	9	700
February ...	2	67	9	—	791
March ...			7		1,247
	2	67	16	Average	458·4

* These were all pullets commencing to lay, so are transferred to previous column.

TRADING ACCOUNT.

	£. s. d.		£. s. d.	£. s. d.
Stock 1st April, /12 ...	3' 7' 6	Sales :		
			£. s. d.	
Food	22'14' 2	Eggs ...	26' 5' 9	
Extra Labour ...	0'12' 0	Birds ...	6'18' 0	
Carriage	1' 9'10	Sittings ...	2' 7' 5	35'11' 2
Sundries	1'15' 9			
		Stock: 31 March, /13		8' 9'10
Balance	14' 1' 9			
	44 1 0			44 1 0

Throughout the year the stock was entirely free from disease.—BOARD OF AGRICULTURE JOURNAL.

SCALY LEG.

Q.: (1) *Is scaly leg hereditary?* (2) *What is its cause?* (3) *How is it cured, and* (4) *Are crooked toes also hereditary?*—NOVICE, Dundee.

A.: (1) No, but very contagious. (2) Caused by an itch mite (sarcoptes mutans) due to wet and dirt. Very often brought on by allowing fowls to dust in coal ashes. For this reason ashes should never be used in a fowl house. (3) Try the following : One pint of paraffin, 1 pint water, ½ lb. soft soap, the mixture to be brought to the boil and then bottled. (Be careful to avoid an explosion.) Anoint the legs twice a day with this mixture, and in a week's time all the scurf and bad scales will come off. If you paraffin your perches once a week it will not reappear. (4) Not to my knowledge.—SOUTH AFRICA POULTRY MAGAZINE.

REPORT ON THE CEYLON POULTRY CLUB.

By Mr. ALFRED LEWIS, Hon. Secy.

The year just closed has been one of considerable activity in the Ceylon Poultry Club. Generally speaking the Club has satisfactorily held its own from the point of view of its own inner working and signs are not wanting that its sphere of usefulness may be considerably widened in the future.

The most striking characteristic of the year has been the increasing interest taken by up-country members in matters relating to Poultry especially in the Dikoya and Maskeliya districts. Colombo fanciers have fallen off considerably both in number and the quality of their birds.

This is due partly to the difficulty in rearing birds and keeping them in show condition in the climate of Colombo and partly to the much more busy life that Colombo men lead to-day than they did in years gone by.

With the facilities both as to climate and mode of life generally that the planter has it is not to be wondered that the centre of activity has been moved to the two most important planting districts.

SHOWS.

Two shows have been held during the year bringing the total up to twenty shows that the Club has held during the ten years of its existence or an average of two every year. The first show of the year was held at Hatton and from a fancier's point of view was undoubtedly a success. More birds were exhibited at this show than at any previous show held in the Island and the quality was quite up to the average. Unfortunately, however, owing to the cost of transport of materials and the difficulty in getting advertisements for schedule and catalogue for a show held in Hatton and to a very generous distribution of rewards this show did not cover expenses.

The second show held in Colombo during September, though considerably smaller, was carried through successfully and will result in a small profit.

It is regretted that owing to the difficulty in collecting amounts due for advertisements in the Show Catalogues neither of these shows accounts can be finally closed.

MAGAZINE.

During the year the Club has discontinued taking the ILLUSTRATED POULTRY RECORD as the basis of its Magazine. Several suggestions have been made and it has now been decided that four to six pages of the TROPICAL AGRICULTURIST be edited on poultry matters each month and that these pages together with any items of interest to members be published and issued as the Ceylon Poultry Club Magazine.

A suggestion to amalgamate the Ceylon Poultry Club with the Ceylon Agricultural Society received a good deal of attention during the year but for various reasons was found to be impracticable.

No Importation Schemes have been undertaken during the period under review but several enquiries from members would seem to indicate that one would be welcomed and it seems advisable to give this matter early attention.

It is regretted that about twenty-six members have not paid their subscription : constant applications and reminders have produced no effect and some more stringent measures to deal with defaulters is undoubtedly necessary.

POULTRY CLUB OF GREAT BRITAIN.

An attempt was made during the year to enrol members of the Ceylon Poultry Club as members of the Poultry Club of Great Britain. An appeal made by the Honorary Secretary with this object was however but poorly supported and only five applications were received.

The Honorary Secretary has been in correspondence with the Poultry Club of Great Britain on the subject but so far without satisfactory result and the amount remitted by these five members still lies to the credit of the Club.

Following the rule adopted by the Poultry Club of Great Britain it is reported for information that just over 1,500 letters, circulars and other matter (excluding magazines) have been issued from the Secretary's Office during the year.

ACCOUNTS.

A statement of accounts is submitted. The reason for the amount for subscriptions being in odd figures is because three members sent in amounts over that which was due by them. Two small outstanding accounts appear on both sides of the ledger.

An item for prizes (Rs. 97) was for Challenge Cup replicas that had not come to hand at date of last account.

Although Rs 600/- was voted for clerical assistance during the year it will be noted that only Rs 46'58 has been spent. The item shown as Medal Rs 1'65 was cost of engraving a Ceylon Poultry Club Medal which was presented to the winner of the best Turkey at the Dairy Show —London.

OFFICERS.

At the General Meeting held on the occasion of the September Show of the Club for the year 1913-14, SIR S. D. BANDARANAIKE was re-elected Vice-President, MR. K. H. PLUMRIDGE was elected President, and MR. F. J. REISS takes the place of MR. CARY in this office as the latter is going home. MR. LEWIS relinquishes the Honorary Secretaryship after three years and MR. C. W. JONES of Castlereagh, Dikoya, takes his place. The Committee was re-elected *en-bloc*.

In conclusion it is hoped that members will continue to give the officers of the Club that support which they have hitherto given their predecessors and so enable it to continue to foster interest in Poultry in Ceylon.

STATEMENT OF ACCOUNTS FOR THE YEAR ENDING 31st OCTOBER 1913.

Receipts.			Expenditure.		
To Balance brought forward		913 67	By postage, etc	...	35'59
,, Subscriptions	...	1,016'03	,, clerical assistance	...	46'58
,, All-Ceylon Exhibition		40'00	,, printing		722'28
,, Advertisements	...	455'00	,, advertisements	...	9'00
,, P. C. of G. B.	...	21'00	,, P. C. of G. B.	...	7'65
February Show	...	859'10	,, Show materials	...	60'00
September Show	...	562'10	,, All-Ceylon Exhibition		36'00
			,, Medal	...	1'65
			,, Prizes	...	97'00
			,, Magazine	...	610'19
			,, Adds : to Show matls :		309'96
			,, Amalgamation	...	10'00
					1,945'90
			,, February Show		1,027'52
			,, September Show		384'35
					3,357'77
			Balance in hand		509'13
		3,866'90			3,866'90

Minutes of a Meeting of the Committee of the Ceylon Poultry Club held at the Maskeliya Club on 26th November, 1913.

Present :—Mr. K. H. Plumridge (President), Messrs. P. Plumridge, H. C. Kennedy and F. J. Reiss.

Notice calling the meeting was read.

Forthcoming Show.—It was resolved that the following be appointed as Show Committee : Messrs. P. Plumridge, H. L. De Mel, Alfred Lewis, C. W. Jones and W. P. D. Vanderstraaten, and that this sub-committee decide where and when the Show be held.

Griffen Scheme.—It was resolved that a notice be printed in the Club Magazine, asking any members who wish to join the scheme to correspond with Mr. F. J. Reiss who will in the meantime approach Mr. James Bateman of Neileethorp Farm, Westmoreland, enquiring if he can purchase what is required.

Resolved that in view of new breeds, such as Blue Orpingtons, having been imported into the Island the acting Honorary Secretary be requested to write home to the British Poultry Association and procure the latest "points" for judging all breeds.

The following new members were elected :—

G. D. H. Alston, Sogama, Pusselawa, and L. H. Deed, Scarborough, Maskeliya.

A vote of thanks, proposed by Mr. Preston Plumridge and seconded by Mr. H. C. Kennedy, to Mr. Alfred Lewis, the acting Honorary Secretary, for all he had done in the interests of the Club was unanimously passed.

It was decided that Mr. Lewis' report of the Club for the past year be published in the Magazine, as well as the Statement of Accounts.

F. J. REISS,

Acting Hon. Secy. for the meeting.

ENTERITIS.

The Editor, The "Ceylon Poultry Club Magazine."

Dear Sir,

I am in receipt of the new edition of the *Poultry Magazine* and on reading through same, I find on page 7, the last paragraph, it states that "Enteritis" is unknown in England.

On reference to the small book written by R. W. Webster, entitled "The Management of Poultry, with a View to Profit," I find on page 144, 145 and 146, a long description of this disease. I would like to quote a few paragraphs on this subject, as it is sure to interest all Poultry Fanciers in this Island.

Webster writes:—Fowl cholera is little known in this country (England of course, Mem.), but an exceedingly infectious and fatal disease termed "Enteritis" possessing many symptoms common to fowl cholera, and requiring the same methods of treatment, has made its appearance in various parts of the country during the past ten years."

"Dr. Klein, the eminent bacteriologist, carefully investigated this disease, and published an account of his researches in the *Field*. Till twenty-four to thirty-six hours before death, wrote Dr. Klein, the fowls appear perfectly right. The first indication of the disease is diarrhœa of thin yellow, frequently fluid, evacuations; the birds are quiet but are never sleepy, which symptom is so characteristic of fowl cholera. On the next morning, or latest the day following, the animals are found dead. On post-mortem examination the heart contains clotted blood, the liver is enlarged, soft, and brittle; usually the spleen is enlarged to twice its normal size or more, and is soft and flaccid. The serous coverings of the intestines, and particularly the mucous membrane lining the cœcal appendages, is highly charged with blood. The cavity of the rectum contains yellow fluid fœcal matter; in the cœcal appendages there is much mucus."

The treatment is the same as that employed for fowl cholera, and every poultry breeder, who values his fowls at all, should be most careful in removing any bird from the pen, immediately the first signs appear.

Chicken Pox:—This disease can be traced most often in Ceylon to those people who buy the village fowls, and run them with, or near their pure-bred fowls. These "villagers" are teeming with this disease.

I think if those who have had the misfortune to get this disease in their yards, will search their memories back a few months, they will almost be sure to find the above explanation as one, if not the correct one.

Personally, I traced one lot of chicken-pox to some village fowls I bought. I intended using these fowls for sitting, as my pure bred ones were non-sitters, and I found in less than a fortnight to a month my young chicks were all suffering from small pox, as well as a few of the village hens I had recently purchased. Chicks as everyone knows are difficult to keep really penned up, they run out, and mix with other hens, hence the disease.

Yours faithfully,
"A. MEMBER"

NEW METHOD OF PRESERVING MILK.

To the already known methods of preserving milk another has been added by two Italian Physicians. Their method is to preserve milk by means of an atmosphere of carbonic acid gas, under pressure. The milk remains unaltered for several days, both in its physical and chemical characters, and in the biological constituents, the ferments. Some of the germs present are killed, while others have their development arrested. By this method, uncooked milk can be kept for eight or twelve days at a temperature of 12° to 14° C., while boiled milk is preserved indefinitely. The gas is produced with little or no trouble. The inventors claim for this method a solution of the question of infant feeding. Milk preserved in this manner ought certainly to be superior to milk sterilised by heat, owing to the fact that milk can be kept by this process for a considerable period with all pathogenic germs absent, while its biochemical functions remain intact, which is not the case where heat sterilisation is used.—Wealth of India.

TOBACCO.

CIGAR WRAPPER LEAF.

The following extract is from an account written by Mr. W. B. Wilson to the South African Agricultural Journal on the production of Cigar Wrapper Tobacco :—

CIGAR TOBACCO CHARACTERISTICS.

Cigar tobacco, in general, is of three sorts according to the use to which it is put, viz., filler, binder, and wrapper ; and each of these is graded according to colour, body, quality, and length.

In the production of cigar wrapper tobacco a certain percentage of the leaves grow too coarse to be used for "wrapper," and they are used for "binder," and some of the inferior leaves are used for "filler ;" so that in producing wrapper you also produce filler and binder. Different soils and climates as well as different varieties tend to make a predominance of one or the other sorts.

Sumatra and Florida Cuban are "wrapper" varieties, and frequently produce as much as 80 per cent. of wrapper, and the rest is used for binder or filler. Those leaves of Sumatra used for filler are not prized as such, but are used to prevent waste. The chief value of Sumatra tobacco lies in its thin but tough elastic leaf, the absence of any strongly marked taste or aroma, and the fine finished appearance it gives a cigar. The absence of any strongly developed taste permits it to be used on all grades of cigars, from fine Havanas to Natal cheroots, without appreciably changing their respective flavours.

Florida Cuban leaf produces a very valuable wrapper, usually a little thicker and more aromatic than the Sumatra leaf. The leaves of Cuban tobacco not suitable for wrappers are more desirable for filler purposes than those of the Sumatra variety.

Connecticut Broadleaf, Havana Seed, and Zimmer Spanish are binder and filler varieties, although a few fine wrappers are occasionally found in a crop of Broadleaf. Broadleaf wrappers are dark and rather coarse, and were a few years ago used very extensively by the trade ; but at present are used to a very limited extent. This decrease in the use of Broadleaf is not because it has deteriorated in quality, but because of the change of the public taste in preferring a cigar wrapped with Cuban or Sumatra leaf, and because it is more economical, as the thinner Cuban and Sumatra leaf wraps so many more cigars per pound of tobacco. Havana Seed leaf is also very little used as wrappers, while Zimmer Spanish is practically never used as such.

The burning quality is a very important character of cigar tobacco and applies to all sorts alike. It should burn freely with a clear firm ash, and retain fire well. The wrapper should not crack, curl, nor char in advance of the fire.

It must not be understood that quality in one sort of leaf means quality in that same leaf if used instead of another sort; or quality if used for one purpose does not mean quality if used for another purpose. Good colour and body in a filler leaf may disqualify it for wrapper purposes; and vice versa, quality in a wrapper leaf does not mean that that leaf is any good for filler or binder purposes. In fact, quality in the two cases refer to quite different properties—the properties that make a good binder being very similar to those that make a good filler.

As stated above, the soil and climate have a very decided effect upon the tobacco. In Cuba, where the finest cigar tobacco in the world is produced, its characteristics vary in different parts of the island. In Santa Clara, practically no wrapper is produced, the tobacco being heavy and aromatic; in Pinar del Rio, a small percentage is used for wrapper; all the tobacco being lighter than that of Santa Clara District. In the Province of Havana a very large percentage is used as wrapper and highly prized as such.

At the Barberton Station, Sumatra has given the best results; Shamel's Hybrid ranking next, and Florida Cuban being rather inferior. We are trying the variety, Halladay's Hybrid, this year for the first time. It promises to be a good variety to grow, resisting well the attack of root gallworm, a weak point with Shamel's Hybrid.

The cigar filler, used for the manufacture of cigars in this country, is mostly grown in Natal. The quality of this tobacco, as compared to Cuban, is as yet poor, but it has improved rapidly in the last few years, and through further improvement Natal may become the filler producing section of South Africa.

PRODUCTION OF SHADE-GROWN CIGAR WRAPPER TOBACCO.

By "shade-grown" we mean tobacco grown under artificial shade.

As to comparative quality, only data referring to this country concerns us here, and the work determining this being at present in hand and touched on already, it will be interesting to note here the origin and development of the shade-grown methods; to which can be appended the cost of erecting an acre tent for our experiments.

The idea originated in Florida, United States of America, about 1896. It was noticed that Sumatra tobacco grown near trees, where it had been partially shaded, was superior in quality to the rest of the field. Experiments were then begun to produce tobacco under artificial shade. The first method of shading was with lattice work, which produced good results, but on account of ease of erecting, openly woven cotton cloth has replaced the lattice work. After a few years of successful work in Florida, the idea was taken up by the United States Department of Agriculture and tried in the northern districts. The results are well known, and the growing of cigar tobacco under artificial shade has become an industry in itself.

CURING.

In the curing shed the tobacco may be very easily ruined if attention is not paid to it. It may dry too quickly and be a bad colour, or it may absorb too much moisture, and if crowded in the barn get "pole sweat" and be destitute of quality.

To get perfect results no exact rule can be laid down for the manipulation of the shed, as the manipulation varies according to the weather. The shed should not be one that will allow of too high a temperature inside. thatch or brick with thatch roof being most desirable. The ventilation should be thorough and so arranged that all ventilators can be tightly closed if desirable. The following general rule will, however, in most cases apply with good results:—

When green tobacco is first hung in the shed, close the barn tight for three or four days, or until the leaves have yellowed. If the weather is cold and damp during this period, put small charcoal fires in the shed. After the tobacco has yellowed, open the ventilators to drive off all surplus moisture. If the weather is dry, have the ventilators open over night and close them next day. From time to time, until the tobacco is cured, it should become fairly dry, but it should become moist every twenty-four hours. Sometimes it is necessary to sprinkle the floor of the shed and hang up wet sacks so that the tobacco will not dry too quickly. When all of the leaf, except the midrib, is cured the shed may be opened during the day and closed at night. From the time the tobacco is cured until it is desired to put it in bundles it should be kept dry and the shed closed tightly all the time. If the shed remains open, the wind breaks the tobacco, and if it is allowed to remain moist "mould" and "white vein" may develop.

When it is desired to tie the tobacco leaves in bunches preparatory to shipping it to the packer, it is necessary to select a time for doing this when the atmosphere is very humid, so the tobacco will come in "case" (absorb moisture) so that it will not break while it is being handled. This condition may be readily attained by opening all doors and ventilators on a damp-night, or foggy rainy day. The tobacco should not be wet, but it should contain just enough moisture to prevent the leaves from breaking. When it is in this condition, take it down out of the shed and pile it in a straight pile, lapping the leaves over each other and letting the laths remain outside of the pile on either side. The pile should not be made on the ground, but on planks or timbers raised about a foot above the ground. After all the tobacco has been put down in this manner, it will hold its moisture a number of days, and during this time it may be prepared and shipped to the packing-house.

The method of procedure is as follows :—Take the laths one at a time and shove the leaves to the middle of the string and cut it at each end of the lath and wind it twice around the butt ends of the leaves and draw the ends of the string between the leaves; this forms what is called a "hand" of tobacco. These "hands" are packed "butts" outward into bales, and the bales are wrapped with paper and hessian, and are then ready to be delivered to the packer or fermenter for the fermentation process. If it is necessary to ship the tobacco a long distance to reach the packing-house, the bales had better be crated. If the fermentation is done by the grower himself or others close to the curing-shed, it is not necessary to bale the tobacco, but it may be taken to the fermenting room after it is made into hands.

The fermentation of cigar tobacco is not a process to be carried out by the farmer, therefore we will not enter into a discussion of this question.

CONCLUSIONS.

1. Cigar wrapper tobacco can be grown in the Barberton District.

2. Sumatra is the most suitable variety so far tried.

3. That the seed beds must be burned to secure plants free from root gallworm; that tobacco must not be planted on sour land, new land, nor land badly infested with the worm; that the soil must be sweet, fertile, and well prepared; that cultivation should be thorough and often; that insects eating the leaves must be kept in check; that the leaves must be picked in the early stages of ripeness and cured slowly but regularly and not allowed to "sponge" or "pole sweat."

4. That much more work is needed to determine such points as the relative values of shade-grown and sun-grown tobacco; the kind of fertilizers to apply to get the best results; experiments be conducted with untried cigar wrapper varieties; to try and produce a good filler on some untried soil or with some new variety; and to discover the best way to control certain insect pests, including nematode or root gallworm.

THE BENEFIT OF LEGUMES.

It is a well known fact that a vigorous leguminous crop such as peas or clover enriches the land in nitrogen, and that another crop, say wheat or oats, following in rotation will benefit from the nitrogen residues. Recent investigations show, however, that the cereal may derive benefit from the legume even when both are growing at the same time. In the *Jour. Agric. Sci.*, vol. 3, experiments are described bearing this inference. Oats were grown in quartz sand in small pots placed in larger pots also filled with quartz sand, but growing peas. The inner pots thus grew oats only, and the large outer pots peas only, and in both cases all the necessary plant foods were added except nitrogen. The inner pots were of two kinds. Where they were of glazed ware the oats showed the effects of nitrogen hunger, but where they were of the ordinary porous pattern the oats grew vigorously.

In the latter case it is believed that soluble nitrogenous matters diffused through the inner pot from the peas growing outside. Confirmation of these results under field conditions seems to be conveyed in a recent bulletin issued from Cornell University. Here also the legume seemed to supply available nitrogen to grass or oats growing along with it at the same time. Thus timothy grown with lucerne contained in its dry matter 15·56 per cent. of crude protein, but without lucerne it had 12·75 per cent. Similar results were got from timothy with and without clover, while oats also contained more protein grown in a mixture than as a pure crop. While these results point to an earlier benefit from the legume upon other crops than had been supposed, it would be insufficient in practice to grow, say, clover with oats instead of giving nitrogenous manure where the oats require this. The greatest benefit from a leguminous crop will be found not upon the crop growing at the same time, but upon the next crop which follows after it is harvested or ploughed in.—JOURNAL OF AGRICULTURE, VICTORIA.

GENERAL.

THE LATE MR. JOHN FERGUSON.

TRIBUTE PAID BY THE BOARD OF AGRICULTURE,

At the last meeting of the Board of Agriculture held at the Council Chamber, on October 3rd.

HIS EXCELLENCY called upon MR. FRANCIS BEVEN to propose the resolution which stood in his name.

MR. BEVEN: Your Excellency and Gentlemen,—I propose that the Ceylon Agricultural Society desires to place on record its appreciation of the valuable services rendered by the late MR. JOHN FERGUSON as a member since the establishment of the Society, its sense of the loss which the cause of Agriculture and every good work in the island has sustained by his lamented death, and its sympathies with the members of the family in their grievous bereavement. I feel sure that this motion will be very heartily accepted by this meeting. I myself readily consented to propose it. It is an honour to be associated in any way in honouring the memory of a good man; and the Board will be only doing its duty in placing on record its appreciation of the readiness and zeal with which MR. FERGUSON gave his services to the Agricultural Society. Those who had been associated with him as original members remember how much the Society in its inception, and in the first year of its existence, needed the persistency and the enthusiasm which ever distinguished our lamented friend. It was by no means a plain sailing barque which SIR HENRY BLAKE had launched, ably supported by SIR ALEXANDER ASHMORE. There were critics who scoffed at the new "Debating Society," which could teach the European planter nothing which he did not know, or teach the native agriculturist who would not or could not be taught. And in such circumstances the Society required a man of MR. FERGUSON'S extensive knowledge and yet wider sympathies to place the matter in its proper light. He showed to those critics that the native agriculturist was not exactly the fool he was represented to be by those who had not the gifts of observation and sympathy, and that everywhere methods based on experience are to be encouraged until Science comes to aid. It was in this way that MR. FERGUSON, as a journalist and a practical man, proved to be the greatest friend of the people of the country. The All-Ceylon Exhibition was due to MR. FERGUSON'S initiative. When SIR HENRY MCCALLUM had evidently before his arrival been disturbed by the criticism and on his arrival formed a minute foreshadowing the withdrawal of Government help, the explanation of the true position of the Society not only satisfied SIR HENRY but resulted in his giving it every support with all the vigour which distinguished him. In these circumstances I feel that it is only a duty that the Society is doing in placing on record what I have already stated in my motion.

MR. LYNE'S TRIBUTE.

MR. LYNE: Your Excellency, I beg leave to second the resolution proposed by MR. FRANCIS BEVEN as I fill a post which was once occupied by MR. FERGUSON, namely the editorship of the "TROPICAL AGRICULTURIST." I am able to bear witness to the fact that MR. FERGUSON's reputation and the work he did was not confined to Ceylon or Ceylon circles. Tropical agriculture in other parts of the Imperial Dominions is only about two decades old, and in those, to us, early days of Tropical Agriculture MR. FERGUSON's books "All about Spices" and "All about Coconuts" were the only literature that we had from which we could learn what the Ceylon Planters were doing. To show you that MR. FERGUSON continued his interest in Ceylon up to a very few months of his death I should like to bring to your notice the opening paragraph of his letter to me, dated July 21st. In answer to a letter from me asking him to help with his influence in promoting the interests of Ceylon as a site for the Tropical College of Agriculture, he said:" You may have thought me unmindful of my promise to help with the Tropical College, but although I don't think it necessary to follow PROFESSOR DUNSTAN's and SIR HENRY's letters in the London *Times*, I have been at the two committee meetings and helped as well as I could." "Helped as well as I could," I think gentlemen we might draw an inspiration from these words of our late Vice-president.

The motion was passed, all standing.

TOMATO GROWING AT PERADENIYA.

Tomatoes, if properly cultivated, are a paying crop. In fact in many islands, such as the Channel and Canary Islands, they are among the chief exports to colder climates, many small proprietors being solely supported by their tomatoes.

About one-eighth of an acre was planted at the Peradeniya Experiment Station with ordinary tomatoes—no special variety having been selected—the crop being sold locally and in Kandy; the gross return amounting to Rs 100/- or Rs 800/- per acre, in 5 months. The net profit would depend upon transport facilities, as the work entailed on the actual cultivation is not heavy. Had the tomatoes been sold in Colombo the returns would have been larger, as Colombo, with its big hotels and shipping, has a large demand for tomatoes of good size, shape, flavour and colour, all four qualities, in the order named, being what the cultivator should aim at obtaining.

For journeys of any distance, the tomatoes should be picked just as they begin to colour and even then require careful packing in light crates.

The disease to which tomatoes in Ceylon are most liable is the withering-disease, due to a bacillus (*Bacillus solanacearum*) attacking the stem near the roots. No cure or preventive of this disease is as yet known. It is very disheartening to see many of the fine plants one has nursed to maturity and just about to bear suddenly begin to wither. There is nothing to do but to pull up each plant the moment it shows any sign of wilting or the disease will spread to the other plants. All such diseased plants must be burnt at

once. No tomatoes must be resown in the same beds where diseased plants have been for at least two years. Young tomatoes will also be noticed turning black in the centre. These must at once be picked off and buried or they will start rotting other fruit on the same bunch. Tomatoes when in fruit do not like continuous rain. It cracks and rots the fruit; so they should be planted at the end of the rains, about two months before dry weather may be expected, so that the ripening fruit gets all the sun it requires.

At the Experiment Station the seed was sown at the end of May, in boxes of good soil and when some six inches high were transplanted. A trellis was made by placing split bamboos about five feet long, three feet apart at the base and tying them together at the top. These were placed all down the bed six feet apart. Long split bamboos were then tied to them laterally each side, the lowest rung being quite close to the ground so that the young plant can be easily tied to it; the succeeding ones at varying distances till the top was reached. Care must be taken to leave plenty of room to walk in between these trellisses. The plants are planted on each side about eight inches apart and as soon as they are tall enough are tied to the first rail by twine or fibre, being fastened as to allow plenty of room for the stem to swell as it grows.

TOMATO GROWING AT PERADENIYA.

As the plant grows taller it is tied in the same way to each rail in succession.

All side-shoots must be nipped off as soon as they appear so as to leave only one leader till the second rail is reached when it may be allowed to form one or two branches.

Cattle manure should have been placed in each hole when planting, and as soon as the flowers appear liquid-manure should be freely applied. This is obtained by keeping a large barrel a quarter full of cattle-manure, filled up with water, frequently stirred and left a couple of weeks or so before using, when it should again be diluted with a little water when applying. Liquid-manure may be applied every week or so till the fruits are almost ready to pluck.

As soon as the bunches are well formed only four fruits should be left on each bunch, the rest being pinched off. This will allow for one or two rotting, but finally only two, or three at the most, should be left on each bunch to ensure good size. All leaves over-hanging the bunches of fruit should be cut away to allow as much sun as possible to ripen the fruit.

Constant vigilance is required in tieing up, nipping off shoots, removing diseased plants and fruit, and thinning out the fruits, to ensure successful growing of tomatoes.

D. S. CORLETT.

DYNAMITE IN FARMING.

Hawaii Agricultural Experiment Station.

We take the following account on the use of dynamite in farming from BULLETIN No. 71 of the Agricultural Department of Trinidad and Tobago:—

On account of the difficulties which have been experienced in bringing about a proper drainage and aeration of Hawaiian soils, the station has for a number of years carried on experiments in the use of dynamite. The holes for receiving sticks of dynamite cannot be drilled in our heavy soils by the use of an ordinary soil auger. In fact, even soil samples cannot be taken by this means in the heaviest soils. The best method of making holes for dynamite consists in driving an iron bar into the soil by means of a heavy hammer. The sticks of dynamite used for this purpose are $1\frac{1}{4}$ inches in diameter by 8 inches in length. The iron bar need therefore not be more than $1\frac{1}{2}$ inches in diameter and should be about 4 feet in length. A 16-pound hammer is sufficient to drive the bar to a depth of $2\frac{1}{2}$ feet with a few vigorous blows. The bar can then be removed by tapping a few times on the side to set it loose from the surrounding soil. It may then be drawn out, using some care not to allow loose soil to fall into the hole. It is not practical to make holes for dynamite in this manner in soils which are excessively dry for the reason that too much loose earth will unavoidably fall into the hole when the bar is removed.

The proper distance apart at which the holes should be driven will depend somewhat on the nature of the land to be dynamited. In general it has been found that the cracks shattered in the soil by the dynamite explosion will meet across the space when the holes are driven 8 or 9 feet apart both ways. In preparing orchard land for planting, the holes will naturally be made at such distances as it is desired to plant the trees. A few preliminary tests will determine whether a half stick is sufficient to shatter the soil or whether a whole stick will be required. When the holes are made 9 feet apart we have generally found it best to use a whole stick. The holes should be firmly tamped all the way from the stick of dynamite to the surface of the ground since otherwise the explosion results in blowing a small quantity of soil high into the air and does not shatter the underlayers of the soil. If the holes are properly tamped the force of the explosion is exercised almost entirely at a considerable depth and shews little surface disturbance. Sometimes the surface layer of the soil is merely lifted a few feet immediately over the stick of dynamite and when this result is brought about the best effect is obtained from the dynamite. If the bar is driven to a depth of $2\frac{1}{2}$ feet in

and bearing at the apex a crown of large, pinnate leaves, each of which may be fifteen feet in length. The fruits are borne in large bunches termed "heads" or "hands," which are small and numerous when the tree first begins to bear but decrease in number and increase in size in the next few years; as many as thirty "heads" may be formed at first, decreasing to anything between two and twelve as the tree ages. The fruits are usually from one to one and a half inches in length, and three quarters to one inch in diameter and are roughly egg-shaped. The fruits ars reddish brown or orange in tint. The fruit is botanically a drupe and consists of three well marked portions. Outside is a layer varying in thickness and composed of a soft fibrous pulp, carrying from fifty-five to sixty-five per cent. of an orange coloured, semi-solid fat, which when extracted constitutes the palm oil of commerce. Inside this pulp is the palm nut, consisting of a hard woody shell, which may vary considerably in thickness, enclosing usually a single palm kernel, though sometimes two or even three are present; the kernel is the second useful product of the palm fruit; it is dark reddish brown or almost black externally, and internally consists of a rather hard, white "flesh" loaded with oil, which when extracted constitutes the "Palm-Kernel oil" of commerce. The tree is very slow growing, and it is estimated that it attains its full height of sixty feet in about one hundred and twenty years."*

CULTIVATION.

The Oil palm is propagated from seed, only seed from eight to ten year old trees and upwards should be used for planting purposes as those from young trees are extremely small and in all probability would not give as good results as seed from mature trees.

The nursery beds should be raised, made of fairly rich humus soil and near a water-course if possible to ensure the proper humidity of the soil. The seed should be planted about eighteen inches apart each way at a depth of from one to one and a half inches. The seed is said to take from four to five weeks to germinate but I find in this country they may take as long as three months. The beds require to be artificially shaded and in dry weather regularly watered. When the seedlings are a foot high they may be transplanted into their permanent quarters which should be about 25 feet apart. Holing similar to that of planting rubber is greatly beneficial.

The tree would appear from its distribution in Malaya to thrive on most soils but a rich humus fairly damp but well drained would in all probability give the best results. Judging from reports the rainfall is an important factor but Malaya is well adapted in that respect.

In West Africa it would appear that the palm is cultivated only to a small extent and then in a rather primitive manner, the natives depend entirely on wild forests for their supply of palm fruits. It is a question whether a well managed plantation in this country where good rail and transport facilities exist will be financially as successful as collecting fruits from the African forests.

Palm Oil cultivation would lend itself well to a catch crop such as coffee as the palms give little shade until they are from six to eight year old, and then probably not too dense to interfere with the growth of catch crops.

YIELD OF FRUIT, ETC.

The following is taken from the Kew Bulletin of Miscellaneous Information, No. 4, 1909:—

* [Bulletin of the Imperial Institute, 1909, Vol. VII, No. 4.]

"The age at which seedling oil palms come into bearing varies slightly in different places, and appears to depend mainly on the situation in which they are planted.

"The fruits take from two to six months to mature, according to the season of the year at which the inflorescences are formed. In the Gold Coast, according to EVANS, the young plants commence to yield their first crop of fruits when about five years old when grown on the rich alluvial lands, but not until the sixth or seventh year in the hilly country, and gradually to increase their yield for 60 to 80 years.

"According to some informants the palms commence bearing in their sixth year, and bear only two or three bunches of fruit, the fruits being small. During the next five years the number of bunches increases from 4 to 6 per year, and in the twelfth year the palm yields its full harvest. FREYBURGER, quoted by GRUNER, states that the bunches of fruit do not become more numerous as the palm grows older, but that both the bunches and the individual fruits increase in size. A young palm, six years old, according to him, bears 1 to 6 small bunches of fruit, whilst one of 10 to 20 years of age has only 1 to 6 very large bunches with well developed fruits.

"THOMSON gives the following particulars as to the growth and yield of the Oil palm from the Western Province of Southern Nigeria.

"On rich newly cleared forest soil, the oil palm is said to bear its first bunches of nuts when it is seven to eight years old. The first bunches are small, about the size of a man's fist, and from eight to thirty of them are formed on the plant annually. As the latter gets older, the bunches increase in size, and number only between four and twelve. When the palm is fully grown, that is at about the age of from eight to ten years the bunches of nuts reach their maximum size, and are developed at the rate of from two to twelve per tree per annum. This rate of yield is continued afterwards practically throughout the natural life of the palm.

"The limits between which the yield varies in the case of full grown trees are given below :—

(*a*) Full grown trees yield from about two to twelve bunches of nuts annually, each bunch weighing from 20 to 56 lb. according to size.

(*b*) An average-sized bunch contains at least 200 nuts, and the weight of the latter varies from 7 to 21 lb.

(*c*) The annual yield in oil of a tree is at least 7½ lb. in weight."

The Bulletin of the Imperial Institute states that in the ordinary variety of Palm Fruits from the Cameroons the pulp contains 60·3 per cent. of palm oil while the kernels contain 48·9 per cent. of palm kernel oil, in an average sized head of fruit.

In Kuala Lumpur Gardens the number of "bunches" to a tree and the number of nuts to a "bunch" compare favourably with the figures quoted; in one bunch there were over 400 nuts. The trees in the Experimental Plantation, Kuala Lumpur, commenced fruiting in the fifth year and produced fair sized bunches with well developed fruits.

CONCLUSION.

The Palm Oil industry would appear to be handicapped in West Africa by transport difficulties and lack of machinery. This industry is practically in the hands of natives and as long as it remains so it is unlikely that machines will be used to any extent on account of the cost.

Transport and machinery are two very important factors and, if the Oil Palm is ever grown to any extent in Malaya, it would be greatly advantageous to have oil factories at one or two stations where all plantations could send their fruits. This would avoid the installation of expensive machinery on individual estates, and small plantations where machinery is out of the question and would save a large sum on the transport of nuts.—F. M. S. AGRIC. BULL.

THE DATE PALM

An easy and well paying culture, produces delicious fruit of great food value at low cost and with a small labour force.

From the **Official Report** of an Agricultural Department we take the following notes:

"It is confidently believed that date culture is one of the most profitable fruit industries and that it will pay to plant date palms on the best lands employing modern horticultural methods.

The amount of labour and care required by the date palm is much less than that necessary for any other fruit tree. The gathering of the fruit is performed easily and quickly by cutting off a whole bunch at a time.

"The Date Palm is almost as important as a shelter and partial shade for other trees and plants as it is for its own fruit."

We Supply Date Palm Seeds of two varieties at the following prices:

Phoenix D. Sapida, a strong and resisting tree, demands no special care, but yields plenty of nice and soft fruit:

On receipt of 3 Shillings we forward about 10 ounces seeds (in full fruit) as sample of no value, under registered postage paid.

On receipt of £1.-, Sterling=10 lbs. nett, by parcel post, postage paid.

Phoenix D. Nobilis requires more attention and plenty of heat; it produces a high class fruit of excellent flavour:

On receipt of 3s. 6d. we forward about 10 ounces seeds (in full fruit) as sample of no value, under registered postage paid.

On receipt of £1.6.--Sterling=10 lbs. nett, by parcel post, postage paid.

Prices for quantities on application. Detailed instructions for cultivation with every order.

Never buy Date Seeds in Kernels, as such, i.e. without the pulp; they easily lose the germination power and offer no guarantee that the trees will produce soft dates, for a dry or hard date is absolutely valueless.—We therefore supply date palm seeds only in the original fruit.

GEVEKOHT & WEDEKIND, Hamburg 1.

THE OIL PALM IN SOUTHERN NIGERIA.

FUTURE PROSPECTS OF OIL AND KERNELS.

The Commercial Intelligence branch of the Board of Trade has received from the Crown Agents for the Colonies a copy of a monograph entitled "The Oil Palm and its Varieties," by MR. J. H. J. FARQUAR, B. Sc., Conservator of Forests in Southern Nigeria. The oil palm is considered from the botanical and commercial points of view, and the methods of marketing, etc. are dealt with.

As regards the future prospects of the trade in the palm oil and palm kernels in Southern Nigeria it is stated that there is no doubt that the merchants buy all the oil and kernels the natives bring them, and this is a large proportion of the available supply within such areas as are easily served by land and waterways. A large number of palm trees are not worked for oil and kernels, however, especially in the district of Kwale, Abob, Asaba, and to

some extent in those of Warri and Sapele. This, however, is not so large a number as many people would make believe, and the statements about palm fruits and nuts rotting on the roadsides often refer to those that are spread out on the roadside to dry before cracking them for kernels, the surface of government made roads being a good drying ground for that purpose.

A very large amount of the total palm oil available in Southern Nigeria is made use of, but this cannot be said of the available supply of palm kernels, which is not utilised to any such extent. The output of oil and kernels has increased enormously of late, chiefly owing to the opening up of water-ways, markets, and roads, and to the settled condition of the country.

The water-ways are the most important carriers of oil products, and they have been much improved by the marine and political departments. Their continued improvement will do more than anything else to increase the output of oil and kernels. The Okrika and Bonny people, who are keen traders, are most anxious to have a water-way cut through to the Imo river at Odibo, which will save them many miles of a rough water journey, and open up the Imo river and its numerous creeks, and a rich country, to healthy rivalry and competition.

The railway is also a carrier of oil products from a very rich oil country in the western province; this is especially true of kernels, which it brings down from its entire length in Southern Nigeria; but as regards oil it only brings it coastwards from the south of Aro. Oil from the north of that place goes northwards, and this internal carrying of oil is likely to continue and increase in the future. It is impossible now for a European merchant to buy palm oil at Obadan, Oshogbo, etc.; 11*s.* a kerosene tin of less than five gallons is asked in the oil season at Ibadan, and 15*s.* at Ilorin. The presence of the railway is not likely to increase to any extent the amount of palm oil in the future, but a large increase in the export of kernels should be expected.

To increase the export of the palm oil products, cheap, plentiful labour is needed. In many districts, notably in Kwale, the scarcity of oil is put down to other works, such as timber concessions, taking up labour. The latter will become more plentiful with an increase in population, whilst for the present hand machinery for the preparation of oil and kernels, which will liberate labour for other works, is most needed. The machines required are hand oil presses, nut-cracking machinery, decorticators, etc., the use of which will also improve the quality of the palm oil products.

At present insufficient available labour is a cause adversely affecting the palm oil and kernel industry. Southern Nigeria being a new and progressive country, the calls on labour are so many and varied that the latter is diverted to the works which attract the labourers most, and the old palm oil and kernel industry, being so well-known, is not now so attractive as the newer and less known forms of labour. These present more attraction for the walkers in steady constant work, regular hours, regular and fixed pay, and more enlivening surroundings than the collection and preparation of palm oil in the bush, carrying the produce to the markets and pulling the produce long journeys in canoes, either as a member of a house working for the head of the house, or as a labourer to a middleman, chief, or private native individual.

The native, in addition, is not yet accustomed to the change brought about by the abolition of slavery and the setting up of the form of domestic government in its stead, which is designated as the house rule. He has also not got accustomed to the number of free men about, and the power of money to command these men as labour, and from their economical use amass more money.

Mechanical transport, and mechanical means for preparing oil will liberate labour as nothing else will, and if an increase of population follows, labour difficulties in the future should not be unsurmountable.—*London Commercial Record.*

BETEL LEAVES

In spite of the fact that the leaves of the Betel *(Piper betel)* are so largely employed for chewing purposes very little has been done with a view to ascertaining their ultimate constituents and how they came to be so popular for chewing purposes.

In a monograph (Vol. III, No. 2 of the Memoirs of the Department of Agriculture in India), DR. MANN publishes the results of his researches into the chemistry and physiology of the leaves, and these have brought out some remarkable facts, the most important of which is the large percentage of potassium nitrate found in the plant.

Calculated on the dry matter of the leaf the amount of this salt varies between 2·3 and 2·7 per cent.

As DR. MANN points out nitrates occur in minute quantities in many plant tissues, but it is seldom found in greater proportion than 0·1 per cent. of dried tissue.

The final conclusions arrived at with regard to nitrate are:—

(1) All parts of the living betel-vine plant contain it.

(2) In the main stem, the amount increases towards the growing tip.

(3) In the leaves on the main stem, on the contrary, the younger leaves contain by far the least amount. As the leaves mature, they very rapidly reach what may be called a normal amount.

(4) The youngest branches and the leaves growing thereon contain less than the mature ones. There is little difference between the various leaves and the various branches which have become mature.

(5) In general, the stems contain more nitrate than the leaves.

As regards the function of the salt in the economy of the plant, it is surmised that the salt acts as a direct supply of nitrate for growth to the leaves and shoots, and that in this case the reduction of the nitrate is done by the growing structure itself, instead of as is usually the case by the roots of the plant.

Another point which was brought out by the investigation is that though there is not much variation in the amount of tannin, the largest percentage would seem to be present in the leaves taken from the middle of the plant. The younger leaves do not appear to have acquired their maximum amount while the older seem to have lost a part of what they possessed.

This is curious on account of the fact that it is precisely these middle leaves which are most desired for chewing. This it is pointed out is different from the case of tea where the largest quantity of tannin is found in the youngest leaves.

The younger leaves showed more essential oil, much more diastase and much more sugar than the older.

A section is also devoted to bleaching (due to oxidation) as bleached leaves are much more appreciated and fetch a higher value in Western India than unbleached leaves: but this part of the subject is of no interest to us as betel leaves are only found in the green state in the local market.

The following references to existing literature on the betel vine and betel oil will be useful to those interested in the subject.

Watt's Dictionary of the Economic Products in India, Article *Piper betel*. Also Agricultural Journal of India, Vol. IV, pp. 365—374; and Poona Agricultural College Magazine, Vol. II, No. 2: Vol. IV, No. 1.

Kemp, Quoted by DYMOCK, WARDEN and HOOPER. Pharmacographica Indica. Part III, p. 188.

Schimmel and Co., Leipzig. Semi-annual Report, 1887 (11,34), 1888 (1,8), 1889 (1,6: 11,6), 1890 (1,6), 1891 (1,5: 11,5), 1893 (11,4), 1907 (11,13).

Eykmann. Berichte der Deutschen chem. Gesellschaft. Vol. 22/27 86 (1889).

Peekolt. Pharm. Rundschau. New York 12/241 (1894).

C. D.

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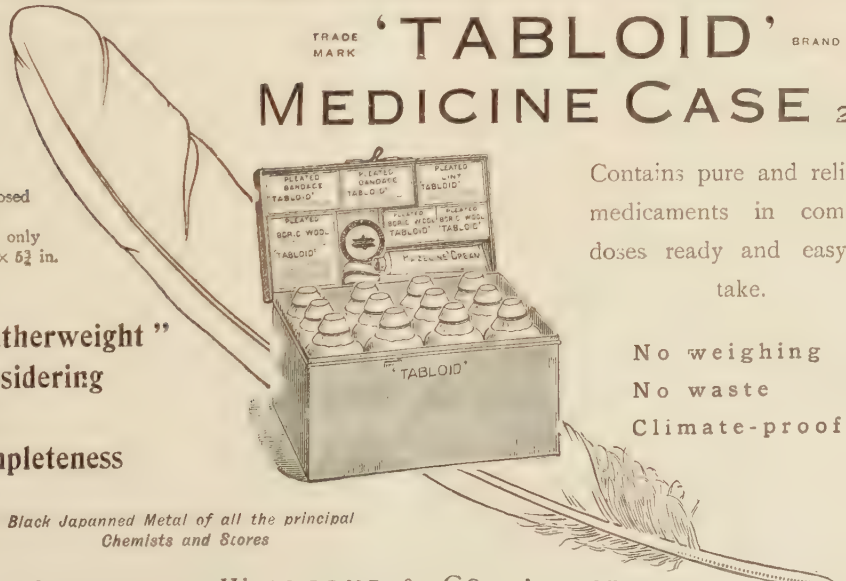

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IRISH EGG RECORDS FOR 1912-1913.

The records of 156 flocks were kept, but of these only 111 are complete.

The general average for the flocks is rather more than 112 eggs per bird per annum.

Two flocks gave over 200 eggs per bird per annum, one over 190, three over 180, two over 170, one over 160, eight over 150, ten over 140, eight over 130, thirteen over 1320, twelve over 110.

In all 57 flocks gave over the general average and 54 less.

Out of the 111 flocks, 76 or 68 % gave over 100 eggs.

White leghorns had the satisfactory average of 134·2 eggs per bird, the best flock of this breed gave 180·2 and the worst 79·5.

White Wyandottes gave an average of 102·2,:—best flock 181·9 worst 7·4.

In Rhode Island Reds the figures are 122·3, 190·7, 106·3. For mixed breeds 112·1, 173·1, 50·1.

The breeds that did well were white Leghorns, brown Leghorns, Rhode Island Reds and Minorcas.

For Minorcas the figures are 204·7, 232·9, 188·6; but this high result is partly due to the fact that the returns relate to only 50 birds.

Black Leghorns had an average of 137·9 eggs per bird per annum.

So much for general results, but a closer examination brings out the value of strain as against breed.

As far as egg production is concerned the one factor is as important as the other.

The chief lesson to be learnt from the records is that it is quite possible for the intelligent poultry keeper to secure an average yield of well over 200 eggs per bird per annum while his neighbour only gets about a fourth the number.

The chief point for consideration is the choice of birds, i.e., the selection of birds of a good egg-laying strain and for this the keeping of records is essential.

The Secretary of the Ceylon Agricultural Society is arranging to get a supply of egg record books.

C. D.

AGRICULTURAL EDUCATION AND RESEARCH IN GREAT BRITAIN.

The Board of Agriculture and Fisheries have since 1888 made grants which now amount to £18,500 per annum in aid of the higher agricultural education in England and Wales; and grants amounting to £7,000 for agricultural education of a less advanced character in most of the counties. Besides the above, grants are also available from the Development Fund for the further extension of education of this type.

England and Wales possess 14 agricultural colleges and agricultural departments of Universities or University Colleges, which after a three or four years' course give the degree of B. Sc. in agriculture or the diploma of agriculture. These are the agricultural departments of the following: (1) University College of Wales, Aberystwith; (2) University College of North Wales, Bangor; (3) Cambridge University; (4) University of Leeds; (5) Armstrong College, Newcastle-upon-Tyne; (6) University of Oxford; (7) University College, Reading; then the following Agricultural Colleges: (1) Royal Agricultural College, Cirencester; (2) College of Agriculture and Horticulture, Holmes Chapel, Cheshire; (3) Midland Agricultural and Dairy College, Kingston, Derby; (4) Harper-Adams Agricultural College, Newport, Salop; (5) Horticultural College, Swanley, Kent; (6) Agricultural and Horticultural College, Uckfield, Sussex; (7) South Eastern Agricultural College, Wye, Kent.

All the above institutes have farms attached for practical and research work, and many of them besides the usual course of studies hold special courses of shorter duration.

There are also four special institutions (1) The British Dairy Institute, Reading; (2) Harris Institute, Preston; (3) National Fruit and Cida Institute, Long Ashton near Bristol; (4) Royal Horticultural Society's School, Wisley, Surrey.

There are further twelve farms and dairy schools and similar institutions founded and provided for by the county councils.

As regards agricultural research a sum of £31,000 per annum is allocated from the Development Fund for the purpose of aiding research into certain definite groups of subjects.

The institutions and the subjects selected are as follows:—

Subject.	Name of Institution.
Plant Physiology.	Imperial College of Science.
,, Breeding.	Cambridge University John Innes Institution
,, Pathology	Royal Botanic Gardens, Kew.
Fruit Growing, including the practical treatment of plant diseases.	Bristol University, in conjunction with the National Fruit and Cider Institute.
Plant Nutrition and Soil Problems.	Rothamsted Experimental Station.
Animal Nutrition	Cambridge University. Leeds University.
Animal Pathology.	Royal Veterinary College. Board's Veterinary Laboratory, Alperton, Middlesex.
Dairying	University College, Reading.
Agricultural Zoology, with special reference to Economic Entomology.	Manchester University.
Agricultural Zoology, with special reference to Helminthology.	Birmingham University.
Economics of Agriculture	Oxford University.

A sum of £3,000 per annum has also been allotted to provide assistance in respect of special investigations for which provision is not otherwise made.

Another direction in which agricultural education and research is being developed is in the supply of technical advice to farmers and the investigation of local problems. A grant of £12,000 has been made for this object.

England and Wales have been divided into eight districts in each of which is situated an Agricultural Department of a University or an Agricultural College, the scientific and technical staffs of which devote themselves to the investigations of difficulties and problems presented especially by small holders.—*Leaflet No. 197 of the Board.*

JAMAICA-PANAMA HATS.

A. P. HANSON.

The plant from which our Jamaica-Panama Hats are made is called Jippi Jappa, sometimes written Ippi Appi, but usually pronounced Yippi Yappa. The Botanical name is "*Carludovica Jamaicensis*," from a plant grown in South America which is called "*Carludovica Palmata*;" the plants however are practically identical.

This plant is not a palm, it is more nearly related to the Aroid family, which includes our Jamaican Coccoes, Tanias, Caladiums, etc.

Correspondents are always writing us for information as to these plants and the process of curing the straw, so we give some information on the subject most of which has been published before but will bear repeating.—EDITOR. JAMAICA AGRIC. SOC. JOUR.

THE CURING OF THE STRAW.

Though the art of making the Jippi Jappa hat was introduced into Jamaica fully seventy-three years ago, the industry remained a struggling one till about a decade ago when both natives and strangers began to realize the real value of the locally manufactured article. Since then the industry has made rapid advancement, and the demand is for the most part in excess of the supply. In Jamaica, about the year 1840, the first hat was made by a Spaniard, Ryan by name, who recognized the plant as that from which the Panama hat was made. This occurred near Glengoffe in the Cassava River District of the Parish of St. Catherine bordering on the Parish of St. Andrew. This and the surrounding districts in both the parishes named are still the seat of the Jippi Jappa industry and hundreds of pounds are circulated over this comparatively limited area weekly. It is not, however, an easy way of obtaining high wages. A very fine hat valued at a guinea on the spot will take perhaps a whole month to be completed and the average day's pay of the hat-makers works out at something between 9*d.* and 1*s.* 3*d.* except in cases of indisposition, convalescence or on rainy days. Our able-bodied men would be better advised to cultivate the soil.

The Jippi Jappa plant is like a palm and the term "straw" applied to the material used in the manufacture of the hats is only a convenient word.

Attempts have been made to cultivate the plant, but experiments prove that it thrives best in its wild surroundings. As the appearance and the durability of the hat depends so much upon the curing of the straw, this stage of the work is of great importance.

The straw is manufactured from the heart-leaf of the plant, while in its unfolded condition. When the leaf begins to open, then it is unfit for the purpose of hat making. Only the best quality heart-leaves can be utilised in making fine hats. A good heart-leaf from the joining with the leaf-stalk to the tip, should be from twenty-four inches upward. The sides of the heart-leaf having a greenish appearance are first taken off, with the help of a thin knife. Next the veins or woody portions along the back, and the apparently hard green portions along the front remote from the woody lines are all removed. This is best done while the heart-leaf remains folded like a fan and is facilitated by splitting the leaf lengthwise in two. For hats of a medium quality the separation may be done economically so that the loose strands into which the leaf is now converted may each be further divided into two parts. For specially fine hats this process must be carried out carefully so that each strand will ultimately form a single fine straw, and this work must be done in such a manner as to insure the uniformity of the straws. The trailing over, the leaves are boiled as in ordinary cooking. This should be done early in the morning of a fair day and the leaves hung loosely in the sunlight upon a clean cord or a long rod stretched out for the purpose. They are by this means properly dried but are left to complete the process of bleaching, hanging in the dew for one or two nights. They are taken in early in the morning when they are very pliable, which prevents breaking when being used. It is while undergoing the drying that the strands roll themselves into straws. The boiling and bleaching process give the white colour to the straw, and when properly done, the right kind of heart-leaves being selected, removes the necessity for sulphuring the hats which only produces a false appearance, neither is there then any necessity to bleach the hats as some strangers have suggested.—JAMAICA AGRIC. SOC. JOUR.

GREEN MANURING.

It is round the action of green manure crops that most interest at present centres. In individual cases large increases in yield have resulted from growing and ploughing in green manure crops and there is no doubt that this practice has improved very considerably the fertility of the land at Palur and Samalkota. Also it has proved very profitable in the Periyar tract. Yet very little is known about the method in which the ploughing in of such crops reacts upon the soil of paddy land. For the last few years MR. HARRISON has been engaged on a series of carefully designed experiments to determine the processes of fermentation which take place in a paddy field and to find some clue to the factors controlling the growth of the crop. His researches were leading him to the conclusion "that drainage or at least some movement

of the soil-water is essential for paddy cultivation and specially so when bulky organic manures are applied." Among his undrained plots paddy fared much worse in those that had received green manure than in those in which the soil was left unmanured. In the course of the year a farm was opened at Manganallur in the midst of very fine heavy soil of Tanjore delta. Sunn hemp was grown for green manure and treated in the method found to succeed at Palur and in Madura and the paddy was transplanted. It failed hopelessly. In the course of the green manuring the land had been flooded and dried, which it was found in this fine soil was sufficient to stop drainage. This result corroborates the results of MR. HARRISON'S experiments that if there is no drainage a green manure crop, unless very carefully managed, is likely to have a deleterious instead of a beneficial effect. On the other hand there is little doubt but that the addition of bulky organic manures will in time improve the drainage of such land and incidentally the fertility. Experiments are being designed at Manganallur to discover how best to effect this. I look upon this failure at Manganallur and MR. HARRISON'S work as two of the most important and instructive local agricultural events of the year. —INDIAN TRADE JOURNAL.

LIMING LAND.

In reply to a correspondent as to the use of unslacked lime, contrasted with the spent lime from tanneries, &c., MR. F. B. GUTHRIE, Chemist, stated :—

The nature of the lime used depends upon the purpose for which it is required. Lime is applied to the soil for the following objects :—

(*a*) To lighten heavy clays.
(*b*) To sweeten sour soils.
(*c*) To supply plant food.

In the first case, either unslacked lime (powdered quicklime), or quite freshly slacked lime is the most effective, the action on the clay being both of a mechanical and chemical nature, breaking up the colloidal clay particles when the lime is slacked in contact with the clay. Slacked lime is much less effective, as the action is only a mechanical one, as there is no combination of the lime with the silicates of the clay.

The quicklime can be applied just as effectively in the form of a fine powder, when it will slack on becoming incorporated with the soil, and in the process of slacking it renders the clay friable. The reason it is recommended to slack the lime in heaps on the field is that quicklime in lump costs less than powdered quicklime, the process of stacking costing nothing; also, because the powdered quicklime soon becomes slack on exposure to the air, and, if obtained from a distance, will probably be no longer quicklime.

In the case of (*b*) either quicklime, slacked lime, or carbonate of lime (chalk) can be used, or the residual lime from tanneries, or from acetylene generators, or any similar form. In the case of (*c*) all the above are effective, also a substance like gypsum (sulphate of lime), phosphate of lime, etc.

With regard to the use of spent lime from tanneries as a substitute for quicklime, it will be found that this lime will not slack (become hot on adding water), and thus will not satisfactorily replace quicklime if the object be to break up stiff clay, but it is a suitable substitute, if required, for purposes (*b*) and (*c*). It undoubtedly is effective in lightening stiff clays, but less effective than quicklime.

Further information on the subject will be found in "Farmer's Bulletin No. 16" (Manures and Manuring).—AGRICULTURAL GAZETTE OF N. S. W.

RAINFALL FOR OCTOBER & NOVEMBER, 1913.

	OCTOBER.		NOVEMBER.	
	1913. ins.	1912. ins.	1913. ins.	1912. ins.
Colombo ...	4·91	17·23	12·89	12·98
Kandy ...	27·05	10·58	10·49	9·78
Galle ...	10·55	19·58	6·26	4·19
Jaffna ...	10·20	5·32	31·40	12·82
Anuradhapura ...	12·67	8·33	12·85	7·33
Kurunegala ...	26·83	17·01	12·01	7·86
Batticaloa ...	5·90	9·16	11·01	13·37
Ratnapura ...	35·00*	26·83	13·11	8·44
Badulla ...	11·61	4·31	6·27	7·77
Nuwara Eliya ...	18·58	8·51	8·41	11·17

*Owing to the floods it was impossible for the ordinary readings to be taken at Ratnapura between the 5th and 11th October inclusive, and therefore the 35·00" given as the October rainfall at Ratnapura is only a rough approximation and not a precise value.—Ed.

PAPAIN: ITS PRODUCTION AND USES.

MR. CHARLES K. MOSER, the United States Consul at Colombo, has been at some pains to collect reliable information about the production and uses of papain—the most important chemical constituent of the papaya fruit—and in a Note recently published by the Department of Commerce at Washington he gives a number of interesting facts. The *Carica papaya* is very commonly cultivated in gardens throughout India and in localities more or less

naturalised. It grows largely also in Ceylon, the East and West Indies, and the Hawaiian Islands. The tree attains a height of 20 to 30 feet, and its fruit resembles a small muskmelon in size, shape, and appearance. The fruit is green when unripe, greenish yellow when ripe, with rich yellow flesh, and contains in its hollow interior hundreds of small, round black seeds with a flavour somewhat like nasturtium seeds. From the fresh milky juice that exudes from both the fruit and the tree itself papain is obtained.

There are several varieties of *Carica papaya*, and the papain derived from the different kinds varies accordingly, the best being obtained from the male trees of the Ceylon hybrid papaya. The papain obtained from the West Indian variety is said to be inferior.

The digestive and disintegrating properties of papain are remarkable. The milk and even the fresh leaves of the papaya tree are said to render the toughest beef tender in the space of two hours. MR. MOSER states that native cooks invariably wrap tough raw beef with the fresh leaves for half an hour, or apply a small quantity of the fresh milk directly to its surface, or put a piece of the green fruit into the raw curry when the beef will not boil soft. If a large quantity of the juice is applied to the raw beef it reduces it in little over half an hour to a pulpy mass that appears as if it had undergone partial digestion. Papain is said to be capable of digesting ten to twelve times its weight of egg albumen at the temperature of the human body.

There are many other uses for papain. Taken as a tabloid or in the form of raw fruit, it acts gently but effectively upon the liver and bowels. It is also said to remove freckles and is frequently used by the natives of Ceylon as a soap. From its power to remove stains in clothes, papain is called "melon bleach" by the Singhalese, and they use it in the water when washing coloured clothes, especially black, which it seems to intensify. In the Antilles it is used as a cosmetic and produces clear, satiny complexions.

Commercial papain, or the crude drug, is a brownish, gummy substance looking like coarse bran or irregular granules of gum arabic. In Ceylon it is prepared by treating the juice of the fruit with rectifying spirits and either drying in the sun or evaporating in dry-air chambers. The age, sex, and variety of the tree are important in determining the quality of the dried preparation. Papain is insoluble in water, coagulates when heated to 175° F or when exposed long to air, and has an acrid taste and acid reaction.

According to a Ceylon authority (DR. H. HUYBERTSZ), commercial papain is prepared in granules and powdered forms. The natural colour of the former is a light brown, which becomes darker when exposed to the air for any length of time. Powdered papain is of a light biscuit colour, which does not change on exposure to air; a darker-coloured powdered papain indicates adulteration or improper preparation. DR. HUYBERTSZ states that European and American importers object to papain in its natural colour and insist that it be white or at least light. This, he says, is a great mistake, as it can only be obtained by bleaching, a process which sacrifices therapeutic efficacy for pharmaceutical appearance.

The taste of papain is slightly saltish and somewhat acrid. It has a peculiar, unmistakable smell, and the "feel" of granular papain should be crisp like biscuit and easily crushed between the fingers. When it is doughy

or sticky it has been adulterated or badly prepared. It also has slight caustic action, and collectors of the fresh juice have the skin of their finger tips blistered. When mixed with water it has a soapy feel. Its adulterations are many and often difficult to detect, and range from dough and bread crumbs coated with the fresh juice and dried to the addition of gutta-percha and wild cactus milk. DR. HUYBERTSZ quotes as follows from a medical journal :—

At present a crude material prepared by natives, and containing abundant adulteration, is purchased cheaply by local firms, who export it as papain or papaya juice. Its preparation is primitive, and consists only of drying in the sun or over a smoky fire, and of thickening by the addition of starchy matter, such as rice congee, bread, flour, arrowroot, biscuits, etc. Recently the native has resorted to the use of a dangerous adulterative material, viz., the milk from the gutta-percha and wild cactus. The latter has irritant properties, acting as a caustic. The comparative failure of papain as a therapeutic agent is undoubtedly explained in part by the sophistication to which it has been subjected.

Up to a comparatively few years ago the value of papain was little understood and it was mostly used in making mucilaginous products. Since then the United States, Germany, and England have imported considerable quantities. However, the exports of papain from Ceylon to the United States amounted to only about Rs. 4,000 in 1911 and Rs. 13,000 in 1912. MR. MOSER is of the opinion that the smallness of the export trade is due to the fact that American importers prefer the inferior qualities from the West Indies ; also they desire a white or bleached papain, which the Ceylon native is not always in a position to supply. American importers could, he thinks, procure, without much difficulty, an almost unlimited supply of the best unadulterated Ceylon papain if they were willing to pay a slightly better price for it than for the West Indies product and would accept it in its natural state.

The price of crude papain in the London market some fifteen years ago was approximately 18*s.* 9*d.* per pound ; now the price for medium first quality is said to be about 8*s.* in London and 8*s.* 9*d.* ($2·10) in New York.

The writer of the report makes no mention of the fact that the juice of the unripe papaya fruit is efficacious in the treatment of certain skin diseases. —INDIAN TRADE JOURNAL.

MANGROVE FORESTS OF THE PHILIPPINES.

A study of the mangrove swamps was begun during the latter part of the preceding fiscal year and was continued during the first of the fiscal year which has just closed. This included a detailed study of the mangrove swamps along the south coast of Mindanao and a similar study of the swamps at the head of Manila Bay. The former are in a practically virgin condition, while the latter are the results of cultivation for long periods.

Cultivated swamps are found in the whole region about the upper part of Manila Bay, from Malabon on the east to Balanga on the west. The virgin mangle has long since disappeared and in many places cultivation extends for 18 or 20 kilometers from the bay. Nipa and bacauan are planted extensively in solid stands, almost to the exclusion of other swamp forms. Hundreds of hectares are planted to bacauan, which is grown for firewood and sold principally in the Manila market. The supply is inadequate as is indicated by the remarkably complete utilization of the swamp and by the use of other and inferior woods to eke out the supply.

The land chosen for planting is brackish or salt swamps at or near the edge of the rivers and where it will be affected by the tides. Very soft mud seems to be the soil on which bacauan makes its most rapid growth. On comparatively firm mud it grows much more slowly, sometimes requiring more than twice as long to make a crop as when grown on the more favourable soil. Freshly deposited soft mud at the edge of the stream is eagerly appropriated for new planting, even though the strip is no more than a couple of metres in width.

No records seem to exist as to how, when or where becauan was first cultivated. There is a tradition that the beginning was in the town of Sexmoan, but there is no record of the earliest plantations. One of the hacenderos, who is now more than 60 years of age, reports that he has been engaged in the cultivation all of his life and that his father and grandfather spent their lives in the same avocation.

Planting takes place usually in the months of May, June, July and August. The seedlings, after they are gathered from existing mangles, are placed in a shady place and allowed to wilt for about two weeks, which is popularly supposed to render them more resistant to the attacks of crabs and other marine animals. In planting, the seedlings are simply shoved a short distance into the mud so that they will stand erect. Cultivation consists principally in keeping the plantation clear of vines, but usually there is very little of this to do and in many cases there is no occasion to spend any labour whatever on cultivation. The usual rotation adopted for the cultivation of bacauan as a firewood crop is from eight to eleven years.—ANNUAL REPORT OF THE DIRECTOR OF FORESTRY, PHILIPPINE ISLANDS.

THE CULTIVATION OF VEGETABLES AND FLOWERS.

P. J. WESTER.

In locating and making a vegetable or flower garden the following points should be kept in mind: (*a*) That the prospective garden must be well sheltered from strong winds; (*b*) that the land must be well drained; (*c*) that the soil must be rich in humus, light, and easily worked.

If not naturally protected by the house and vegetation, a windbreak may be constructed by the planting of shrubs or small trees around the garden, yet it should be well exposed to the sun. Well-drained land is absolutely essential; if the site for the garden is not well drained naturally, drainage must be provided for by ditching.

SEED BED.

Many plants succeed better if the seed is sown in a seed bed, where, during the early stages of their growth, they may be protected better from the hot rays of the sun, heavy rains, and noxious insects, than if the seed were sown in the open ground. If the seed bed is prepared in the garden a small bamboo frame should be erected over it, and a roof made of palm leaves or cogon grass.

SEED BOXES.

If insects, particularly ants, are troublesome, it is best to sow the seeds in shallow boxes, commonly called "flats." Make the flats about 10 centimeters deep, and in nailing them allow enough space between the bottom boards (3 to 5 millimeters) to provide for drainage; a number of small holes bored in the bottom of the flat will also serve to carry off any surplus water.

Cover the bottom of the flat with a layer (about 2 centimeters deep) of coal ashes, gravel, or small stones, and then fill the flat to within a centimeter of the top with fine, rich, preferably *sandy* loam; heavy, *sticky* loam is not suitable. Firm the soil moderately before sowing the seed.

Sow the seed in rows about 4 to 5 centimeters apart, from 3 to 10 millimeters apart in the row, depending upon the size of seed and vigor of the plant. Cover the seed slightly with a layer of soil—of the thickness of the seed planted, is a good rule—and firm the soil well and then water thoroughly

After having planted the seed do not allow the soil in the flat to dry out, or the seed will not germinate; nor, on the other hand, should it be watered so often that the soil is kept continually wet and soggy—for in this case the seed decays or the young plants are likely to rot off at the surface of the ground. With many plants this stage is the most critical in their development and many are lost by excessive watering.

After the plants have appeared above ground, a good rule is to allow the soil to become so dry that the plants are on the point of wilting and *then water the flat thoroughly* so that the water penetrates to the bottom. Frequent and shallow watering is very pernicious in that it encourages a root system near the surface of the soil and prevents the development of deep-going roots, and thus stunts the plants.

Weeds should, of course, be pulled out whenever they appear.

If ants and other crawling insects are troublesome, place the seed boxes on a table made of bamboo with the legs standing in tin cans filled with water.

TRANSPLANTING.

When the young plants begin to crowd each other transplant them into other boxes prepared as heretofore described, about 3 to 5 centimeters apart. Before removing the plants the seed flat should be watered thoroughly and the flat into which the plants are transplanted should be well watered after the operation.

PLANTING IN THE OPEN.

When the plants are 6 to 12 or more centimeters tall, depending upon the kind, they are ready to set out in their permanent position. It is well to place the plant box in the full sunlight a few days prior to setting out the plants in order to accustom them to the change. The transplanting of the plants from the seed bed or flat to the garden is best accomplished during a

cloudy day or late in the afternoon. Cut off about one-half of the leaves. Disturb the roots as little as possible, and firm the soil well around them when the plants are set out.

In the case of some plants, such as beans, peas, radishes, carrots, maize, cucumbers, melons, okra, etc., it is better to plant the seed direct in the field, as they do not transplant well. If for any reason, however, it is desired not to do so, make small baskets of banana leaves or stalks about 8 centimeters in diameter, fill them with earth, and place them side by side in a flat When the plants are large enough to set out in the field, water the plants thoroughly, carefully remove the basket, and set out each plant with its ball of earth *without breaking it.*

PLANTING DISTANCES FOR VEGETABLES.

No general rule can be laid down as to distances at which to plant, as this depends upon the character of the plant; and, to some extent, upon the fertility of the soil. The following table indicates the approximate distances that should be used for the most common vegetables:

Table showing at what distances the most common vegetables should be planted in the field and garden.

Name of plant.	Distance in row.	Distance between rows.
Beans:		
Lima (hills)	1 meter	1.5 meters.
String (seeds)	10 centimeters	50 centimeters.
Beet	Drill	35 centimeters.
Cabbage	50 centimeters	75 centimeters.
Carrot	Drill	30 centimeters.
Cucumber (hills)	1'5 meters	2 meters.
Eggplant (hills)	60 centimeters	75 centimeters.
Garlic	5 centimeters	25 centimeters.
Lettuce	15 centimeters	15 to 30 centimeters.
Maize (hills)	1 meter	1 meter.
Melon	1'5 meters	1'5 meters.
Melon, water	2 meters	2 meters.
Okra	50 centimeters	1 meter.
Onion	Drill	30 centimeters.
Parsley	...do	25 centimeters.
Peas	...do	50 to 90 centimeters.
Pepper	40 centimeters	75 centimeters.
Radish	Drill	20 centimeters.
Roselle (hills)	1 to 2'5 meters	1 to 2'5 meters.
Squash	1'5 meters	2 meters.
Sweet potato	40 centimeters	1 meter.
Tomato	60 to 75 centimeters	Do.
Turnip	10 centimeters	60 centimeters.

—PHILIPPINE AGRICULTURAL REVIEW.

NATURE STUDY IN SECONDARY SCHOOLS.

C. DRIEBERG.

Nature Study may be described as the study of natural objects and phenomena firsthand and without reference to their systematic order or relationship. That is to say, the study should not be pursued on scientific lines, and should be independent of scientific principles, the grasping of which must be left to a later stage, but at the same time it should be under scientific guidance.

There is an idea prevalent that nature study must be specially associated with the vegetable kingdom, less so with animal kingdom, and least of all with the mineral kingdom; further, that it should deal solely with biological facts and phenomena to the exclusion of those belonging to the domain of chemistry and physics.

The fact is that plants and animals are more attractive objects of study to the young, since as living things they possess certain qualities in common with the students themselves and thereby gain their sympathy. The life-histories of living things are bound to be more interesting than the dry facts pertaining to inanimate nature.

And yet there is so intimate a relationship between the three kingdoms that the study of the one is naturally linked with that of the other.

Plants, however, are pre-eminent among the objects of nature study, as being ready to hand, familiar, convenient, and interesting to study, particularly, where there is a garden near by.

It is indeed advisable, especially in the case of younger children, that the objects of study should be as varied as possible. To-day it may be a flower or leaf, to-morrow a bird or insect, the next day a stone or a running stream, and so on.

In the case of older children it is possible to so choose lessons as to allow the three kingdoms of nature to share the attention of the pupil, and the common facts and phenomena of geology, chemistry, and physics, as well as those of biology to be investigated.

In this way nature study may be made the stepping stone to science, though its value is perhaps greatest in the case of the student who never reaches the truly scientific plane.

In my own case (if I may be pardoned a personal reference) it was not till I was 21 that I began a course of science, and my studies had previously run so completely in one groove that I was at that age innocent of the most elementary facts of nature study. Often had I occasion to regret that my mind had not been prepared for a scientific course by a training in nature study.

But the worst case is that of the student who never goes on to the study of science at any time. "I am sometimes inclined to think," remarked a local landowner to me, "that plants are really living things." Now, had this person, whose education was wholly on the literary side, gone through a course of nature study as a boy, he would have realized the fact that the plant was in a sense as much alive as himself, inasmuch as it breathes and nourishes itself, reproduces its kind, and goes through a definite life-cycle as all living things do.

Whatever may be said for or against the strictly utilitarian value of nature study, it is the benefit of it rather than the use of it that is the primary question. "Its claims to further and fuller recognition," says PROFESSOR LLOYD MORGAN, "rest on its educational value from a general and not merely technical point of view, and its benefits do not chiefly lie in the imparting of a particular kind of information, but consists in fostering an attitude of mental alertness and of inquiry into the meaning of familiar facts in nature."

PROFESSOR ARTHUR THOMPSON describes nature study as a fundamental discipline, and, if rightly prosecuted, as tending to the culture of the senses, and to what he terms "brain-stretching," as well as the development of those artistic emotions which form no small part of the joy of life.

DR. HALL of Rothamsted declares that nature study must stand or fall by its educational value. The mere collecting of natural objects and the copying of the teacher's notes are of no real value, nor are what he terms "sugar-coated science pills" attractive lessons of a scientific character. The chief aim must be method and the practical logic of cause and effect in nature

The style of teaching is, therefore, of the utmost importance. It should be informal and the subject should be fresh to the pupils, so as to prevent previous "mugging up," and to induce observation and original thought. As L. H. BAILEY of Cornell University puts it, "ideas should be suggested by the things and not things by the ideas." The method should therefore be, as far as possible, heuristic, and information where given should be supplementary to investigation. Information only without investigation is of little educational value, and where the teacher merely talks and the pupils just listen, there is very little gained.

In the case of the older pupils, CANON STEWARD of Salisbury Training School considers that the teaching could be further supplemented with advantage by the use of the lecture room, laboratory, lantern slides, etc., but only under the teacher's judgment and intelligence.

But the difficulty is to get the right type of teacher. The man we want is the *pedagogue* in the original sense of a leader and not a driver of boys; a man who, so to speak, takes the child by the hand and says, "Come along with me and see." It is not so much the highly-trained man that is needed, but the man imbued with the proper spirit. In the case of a teacher with high scientific qualifications, there is, again, the danger of his going too fast for the pupil without giving him an opportunity of finding things out for himself. Given the teacher with the proper bent and mood, and there is nothing to fear; but with a teacher who, from some cause or other, is only interested in the subject from a sense of duty, there is much to apprehend, for while the teaching of an ordinary class subject may be bad without any serious consequences, a faulty education in nature study means the distortion of the child's outlook on the world.

I once had an assistant who possessed this peculiar gift (I can call it nothing else) of infusing his own enthusiasm into his pupils in the study of natural objects, and I never cease to regret his loss. We do not want men of the type that is always taking pains to impress upon the pupils his own superior knowledge. The ideal teacher is one who realizes that he occupies

the position he holds only because he is an older and more experienced learner than his pupils. The pupil should be made to realize that knowledge is not the monopoly of the teacher, but is within the grasp of every one who seeks it. Indeed, the best teacher is the one whose pupils outrun him in the farthest and fastest.

I would here wish to say a word about the school garden. The object of the school garden is not to promote agriculture or horticulture, though this might result indirectly. To try to make it a means of industrial training would be a fatal mistake, not merely because such attempts have proved ineffective, but also because the principle is unscientific.

The real object of a school garden is to improve the general education of the scholars by making it a field for nature study. With this object it should be incorporated with the organization of the school.

Besides giving positive knowledge and a pleasant recreation, the work of the garden cultivates a love of industry, order, neatness, a sense of beauty, form, and colour, and touches the heart as well as the brain. As MR. ROOPER of the English Board of Education puts it "it is a natural gymnastic which bridges over the space that separates physical from intellectual growth, and serves as a link between learning and life."

Educational authorities are generally agreed that the time has come when all teachers should go through a course of normal training in nature, teaching as a part of their course, and not be expected to casually pick up the knowledge they need. For these teachers who have not in the past had opportunities for this study, special short courses of instruction will have to be provided.

It is a matter for congratulation that these requirements have not been lost sight of in Ceylon, and that the training given at the Government College for Teachers includes instruction in nature teaching. With the publication of a Teacher's Nature Study Manual which MR. EVANS is engaged on, the value of already existing school gardens will be enormously increased.

As the officer responsible for the work of school gardens, I may be credited or rather discredited with a strong bias in their favour, but I can only say that any one who goes into the matter with an unprejudiced mind and who has had some experience of the old order of things and the opportunity of comparing them with the new, must admit that school gardens worked on proper lines are playing an important *rôle* in the regeneration (in more senses than one) of the children in our rural schools. I have seen the complexion of the school *régime* entirely altered in a comparatively short time, and with material benefit to the whole country side. How else could it be when the environment of the school-boy during the most impressionable years of his life become transformed from what has been described as "a prison yard bereft of life and beauty" to a veritable *pleasance?*

PROFESSOR GEDDES, touching on this subject, says :—"Of all the facilities which teacher and school-board can provide, and which central authority can encourage, let me plead for the school garden." And then he goes on to refer to the change that is being brought about by the introduction of nature study into the school curriculum, as a result of which "education hrough bookish instruction and routine apprenticeship," after being

"half helped and half paralysed" by modern or technical instruction, is being succeeded by a better and concretely practical system, which sees life and prepares for it.

As regards the range of general knowledge it is possible to gain by nature study in association with the school garden, that is only limited by the resources of the teacher. The following hastily written notes will give some idea of it.

Site and aspect, sun and shade, the sun in the solar system, how it "travels," the sundial, variation of the atmospheric temperature—local and general, causes of variation, measuring heat, the thermometer, evaporation of water, sunlight in relation to plant nutrition and growth, weathering, dew, wind, cold and frost, how soils are formed, ingredients of soil, sand, clay, etc., their properties, soil mixing, measuring beds and calculating areas, necessity for drainage, advantages, why does water rise from a saucer into a flower pot standing in it? properties of water, drought, mulching, how it helps to retain soil moisture, the seed, the plant egg, testing for vitality, percentage of good seed, germination, necessary conditions, planting distances, calculation of plants on a given area, rain, how formed, rainfall and vegetation, rainfall of different regions, the rain gauge, monsoons, growth of plants, rate of growth, nutrition, plant-food in soil and air, composition of air, how plants help to keep the atmosphere pure, transpiration of water, respiration or breathing, the parts of the plant, the flower, fertilization, formation of fruit and seed, insects and birds helping or hindering cultivation, fungus pests, weeds, the geographical distribution of plants, designing and laying out beds, plan of garden, weighing produce, records and accounts, descriptions or essays.

In conclusion, the recommendations which I should make are:—

(1) That a syllabus for a junior as well as a senior course of nature study be prepared for the use of teachers.

(2) That pupils should be taken through this course and complete it at about the age of twelve.

(3) That the syllabus should deal with the facts and phenomena of common experience, whether connected with botany or zoology, chemistry or physics, geology or astronomy.

(4) That the seasonal method of treatment be adopted, and that the syllabus conform to local conditions.

(5) That at the end of this course the pupil should go on to a three-years' course of experimental science proper in chemistry, physics, and biology.

(6) That after this, each pupil should specialize in any one or two branches of science according to the future career he decides upon.

ANURADHAPURA EXPERIMENT STATION.

FIRST PROGRESS REPORT.

The area of the block of jungle at present set apart for this new Experiment Station is close upon 90 acres.

At the southern boundary 14 acres have been well cleared at a cost of Rs. 18·75 per acre. The work of opening comprises in addition:—

1. Eradicating stumps—with axe and mamoty, American stump extractor and dynamite.
2. Levelling the land
3. Constructing irrigation channels
4. Cutting drains
5. Constructing roads
6. Marking out plots
7. Planting

A line ½ a mile in length has been cut along the eastern boundary for the erection of a barbed wire fence.

Fifteen cooly lines (mud and wattle) have been erected at a cost of Rs. 14·25 per room.

October 20th, 1913. G. HARBORD.

Sales of Produce in British and Continental Markets.

Fibres, Cotton, Grain, Oil Seeds, Hides and Skins, Timber, Rubber, Drugs, Wool, Ores, Mica, Gums, Tea, Cocoa, Coffee, Copra, Sugar, etc., are being regularly dealt in; Keymer, Son & Co., being selling Agents for Estates, Mills and Exporters.

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RATE OF SUBSCRIPTION.

There are many who consider the local subscription of Rs. 8 per annum to the Agricultural Society (and TROPICAL AGRICULTURIST) an inconvenient sum to remit, and some have expressed a wish that it should be raised to Rs. 10 to make it possible to pay the amount by cheque.

It was felt, however, that the addition of Rs. 2, without a *quid-pro-quo* would be a hardship to a great many.

This year the Secretary published a small Year Book for which an additional charge was made: and the idea has now been suggested that if the subscription be raised to Rs. 10 this year book, revised and enlarged, might be issued free to all subscribers. Brought up to date and improved with the assistance of qualified helpers, the annual should prove a useful work of reference and supply a deal of information which subscribers would otherwise have to apply for in writing. In this way much unnecessary correspondence would be saved both to the Society and its members.

The question of fixing the local subscription at Rs. 10 and the foreign subscription at the uniform rate of Rs. 15 (£1), will be brought up for consideration at the next meeting of the Board (on February 3rd), and it is hoped in view of the improvement already affected in the TROPICAL AGRICULTURIST and the additional free offer of an annual publication, that subscribers will not demur to pay the slightly enhanced subscription (due but once a year), which is but a small demand for the return it makes.

The convenience of being able to pay the subscription by cheque is one which the majority of local subscribers will no doubt appreciate.

C. DRIEBERG,
Secretary, C.A.S.

HORSES.

HOW THEY ARE SPOILED.

There are a good many people who, either by reason of their bad or careless driving, succeed in spoiling a horse which came to them as free from vice or tricks as could be desired. A horse which by nature is not a shier can easily be transformed into something very like one by being unmercifully thrashed if he becomes startled at some unfamiliar sight. The next time he encounters anything of the kind he remembers his thrashing and associates the sight with suffering; then he shies again, and the punishment is repeated, with disastrous effects. The man who is careless about his harness, and who allows his horse to drive himself, will spoil any animal, and is as likely to end

up by letting the horse down as not. But this observation must not be taken as suggesting that a driver should always be fidgeting and worrying his horse. His aim should be to get the animal to go right and to keep him at it; it is often the slovenly coachman who produces the ill-mannered horse. In frequent cases it is the driver's fault when a horse stumbles, but even when it is not so it is quite unnecessary to use the whip in nine cases out of ten. If the horse once begins to connect a stumble with a thrashing, he gets flurried when he puts a foot wrong, and is very likely to come down in consequence; but if he gets careless it is necessary to wake him up by a light stroke just to remind him that he must keep awake. Of course, the jagging at a horse's mouth is as certain a way to ruin the animal as anything can be; and it is very far removed from a good practice to shout at and rate a horse for no particular fault. A naturally timid animal is liable to lose its head on such occasions, whilst a bad-tempered one resents it; for horses are not fools, and are far more amenable to kindness combined with firmness than they are to ill-usage or violence of any kind. This being the case, it is unfortunate that their memories should be so good, for the recollection of chastisement has often transformed an ordinarily tempered horse a perfect savage, and a good reliable worker into a useless brute. Of course horses can be spoiled in many other ways, but it is believed that the causes mentioned above are responsible for most of the losses incurred by owners through the deterioration of their animals.—LIVE STOCK JOURNAL.

CRUELTY OF JERKING THE REINS.

Pulling violently, and especially jerking the reins, is a too common practice with cabmen and drivers of horses, and, as they probably do it more out of ignorance than sheer brutality or spite, it is well they should know that the practice is a most harmful as well as painful one, both as regards the temper and the physical structure of the horse. A French expert, BARON HENRY D'ANCHALD, has published the results of his observations on the painful effects of the practice of jerking the reins. "We are apt to forget," he writes, "that this mouth, which serves as the medium of communication between us and the animal, should never be subjected to rough treatment or shock if it is to remain sensitive and beautiful, as it undoubtedly is; that this mouth becomes bewildered and uncertain, so to speak, and hard under stupid or violent treatment, the jerking of the reins rendering the animal indocile, sullen, and stubborn."

The details of M. D'ANCHALD's experiments we have no space to go into here, but, to appreciate more nearly the intensity of the pain caused by the jerking of the reins, it need only be remembered that the cannon of the bit, which is more or less thick and round, rests upon but a very small part of a membrane, which is delicate, very nervous, and is itself the envelope of a tolerably trenchant bone. If one can imagine, therefore, the effect of a 33-lb. weight (so M. D'ANCHALD calculates the pressure) falling on one's

toes from a height of, say, 15 to 20 inches, one realises to some extent the pain which is inflicted on an unfortunate horse by this always brutal jerking of the reins. Not only is jerking the reins useless in itself, but it is also most harmful, especially to young horses, as it compromises their future value and usefulness. In addition to that, the pain caused by it involves a loss of energy and fatigue, which soon uses up the animal. A flick of the whip applied to the hindquarters, or the withers, for example, should be all that is needed to stimulate the horse to fresh exertion.—QUEENSLAND JOURNAL.

PEAT PLANT FOOD.

The lecture delivered by PROFESSOR BOTTOMLEY to the members of the Horticultural Club on Tuesday last dealt with a subject of more than passing interest. Starting from the premise that a first essential of soil fertility is the existence in the soil of plentiful supplies of nitrogen in an assimilable form, PROFESSOR BOTTOMLEY set himself the task of discovering whether these supplies might not be provided by encouraging the nitrogen-fixing soil organisms to work faster than they do in ordinary soils. Attempts to produce this result by the simple expedient of adding artificial cultures of nitrogen-fixing bacteria to the soil have not proved successful. Wherefore it would appear that in order to speed up the rate of nitrogen fixation in a soil, it is not only necessary that the nitrogen-fixing organisms should be present, but that a suitable "seed bed" for the growth and increase of these organisms must also be provided. In his search for a medium which shall serve for the rapid multiplication of the nitrogen fixers, PROFESSOR BOTTOMLEY'S attention was directed to peat. As a result of experiments with this material, he appears to have demonstrated beyond dispute that by suitable treatment it may be changed into a manure of markable potency. The method employed to produce this "peat manure" is somewhat complicated, and consists in three processes, first in the treatment of the peat with certain bacteria which bring about decomposition in the organic constituents and result in the production of humates; second, the sterilisation of the treated peat; and, third, the inoculation of the sterilised peat with nitrogen-fixing organisms. The figures quoted by the PROFESSOR support his claim that nitrogen fixation proceeds at a rapid rate in the treated, sterilised peat, and show that the final product is extremely rich in nitrogen compounds.

The exact nature of the changes set up in the course of these operations is by no means clear, and much more experimental work will be necessary before we can hope to understand the chemistry of the process.

Of more immediate importance, however, is the question whether all the stages of treatment are necessary; for on the answer to this question depends the price at which "peat manure" can be put on the market. We need not discuss at present the further question whether the remarkable manurial effects produced by this preparation are to be attributed solely to the fact that it contains a large amount of nitrogen, or whether they are due also to the liberation in the peat of other plant foods. It will be patent to everyone that it should prove possible to make peat plant food cheaply, and if further trials confirm the results of those which have been made at Kew and elsewhere, PROFESSOR BOTTOMLEY'S discovery will be of great service to horticulture and agriculture.—GARDENERS' CHRONICLE.

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Latest Monthly Prices Current.

		QUALITY.	QUOTATIONS.
ALOES, Socotrine	cwt.	Fair to fine	55/ a 65/
Zanzibar & Hepatic	,,	Common to good	40/ a 65/
ARROWROOT (Natal)	lb.	Fair to fine	6½d a 6¾d
BEES' WAX	cwt.		
Zanzibar Yellow	,,	Slightly drossy to fair	£7 12/6a£7 17/6
East Indian, bleached	,,	Fair to good	£8 10/a £8 15/
,, unbleached	,,	Dark to good genuine	£6 10/ a £7
,, Madagascar	,,	Dark to good palish	£7 15/a £8 2/6
CAMPHOR, Japan	lb.	Refined	1/4½ a 1/6
China	cwt.	Fair average quality	155/
CARDAMOMS, Tuticorin		Good to fine bold	6/ a 6/3
per lb		Middling lean	5,2 a 5/7
Malabar, Tellicherry	,,	Good to fine bold	6/ a 6/3
Calicut	,,	Brownish	5/2 a 5/8
Mangalore	,,	Med Brown to good bold	5/3 a 6/6
Ceylon, Mysore	,,	Small fair to fine plump	4/ 5 a 6/2
Malabar	,,	Fair to good	3/8 a 3/10
Seeds, E. I. & Ceylon	,,	Fair to good	4/9 a 4/11
Ceylon "Long Wild"	,,	Shelly to good	2/3 a 4/
CASTOR OIL, Calcutta	,,	Good 2nds	Nominal
CHILLIES, Zanzibar	cwt.	Dull to fine bright	37/6 a 45/
Japan	,,	Fair bright small	28/ a 32/6
CINCHONA BARK.—Ceylon	lb.	Crown, Renewed	3⅜ d a 7 d
		Org. Stem	2d a 6d
		Red Org Stem	1¾ d a 4¼d
		Renewed	3d a 5½d
		Root	1⅞d a 4d
CINNAMON, Ceylon	1sts.	Good to fine quill	1/3 a 1/7
per lb.	2nds.	,, ,,	1/2 a 1/6
	3rds.	,, ,,	1/1 a 1/5
	4ths.	,, ,,	1/ a 1/3
Chips, &c.,		Fair to fine bold	2d a 4d
CLOVES, Penang	lb.	Dull to fine bright pkd.	1/1 a 1/3
Amboyna	,,	Dull to fine	10d a 10½d
Zanzibar	,,	Fair and fine bright	6d a 6¼d
Madagascar	,,	Fair	7d
Stems	,,	Fair	3d
COFFEE			
Ceylon Plantation	cwt.	Medium to bold	Nominal
Native		Good ordinary	Nominal
Liberian	,,	Fair to bold	63/a 80/
COCOA, Ceylon Plant.	,,	Special Marks	84/ a 92/6
		Red to good	78/ a 82/6
Native Estate	,,	Ordinary to red	42/ a 70/
Java and Celebes	,,	Small to good red	30s a 93s
COLOMBO ROOT	,,	Middling to good	14/ a 21/
CROTON SEEDS, sifted	,,	Dull to fair	57/6 a 60/
CUBEBS	,, ,,	Ord. stalky to good	135/ a 165
GINGER, Bengal, rough	,,	Fair	19/
Calicut, Cut A	,,	Medium to fine bold	60/ a 75/
B & C	,,	Small and medium	36/ a 60/
Cochin, Rough	,,	Common to fine bold	22/6 a 30/
		Small and D's	22,6
Japan	,,	Unsplit	23
GUM AMMONIACUM	,,	Ord. Blocky to fair clean	40/s a 72s 6d
ANIMI, Zanzibar		Pale and amber, ster. srts	£14 10/a £16 10/
	,,	,, ,, little red	£11 a £12
	,,	Bean and Pea size ditto	70 a £11
	,,	Fair to good red sorts	£8 10/ a £10 10/
	,,	Med. and bold glassy sorts	£5 a £7
Madagascar	,,	Fair to good palish	£4 a £8
	,,	,, red	£4 a £7
ARABIC, E. I. & Aden	,,	Ordinary to good pale	28/ a 32/ nom
Turkey sorts	,,		31/ a 55/
Ghatti	,,	Sorts to fine pale	18/6 a 32/6 nom
Kurrachee	,,	Reddish to good pale	25 a 30s nom
Madras	,,	Dark to fine pale	22/6 a 29/6 nom
ASSAFŒTIDA	,,	Clean fr. to gd. almonds	£7 a £8
		com. stony to good block	40s a £5 1 2/6
KINO	lb.	Fair to fine bright	6d a 1/5
MYRRH, Aden sorts	cwt.	Middling to good	65/ a 75/
Somali	,,	,, ,,	55s a 56s
OLIBANUM, drop	,,	Good to fine white	45s a 50s
	,,	Middling to fair	35s a 40s
pickings	,,	Low to good pale	15/ a 27/6
siftings	,,	Slightly foul to fine	18 s a 21s
INDIA RUBBER	lb.	Fine Para smoked & sheets	2/4⅜
		Crepe ordinary to fine	2/3 ½a2/⅜
Ceylon, Straits,	,,	Fine Block	2/3¾
Malay Straits, etc.	,,	Scrap fair to fine	1/7 a 1/9
	,,	Plantation	1/9
Assam	,,	Fair 11 to ord. red No. 1.	1/3 a 1/6
	,,	,, ,, ,,	1/2 a 1/4
Rangoon	,,		
	,,		

		QUALITY.	QUOTATIONS.
INDIARUBBER	lb.		
Borneo	,,	Common to good	9d a 1/2
Java	,,	Good to fine red	1/4 a 1/5
Penang	,,	Low white to prime red	9 d a 1/3
Mozambique	,,	Fair to fine red ball	1/10 a 2/2
	,,	Sausage, fair to good	1/9 a 2/1
Nyassaland	,,	Fair to fine ball	1/9 a 2/1
Madagascar	,,	Fr to fine pinky & white	1/6 a 1/9
	,,	Majunga & blk coated	1/ a 1/3
	,,	Niggers, low to good	6d a 1/6
New Guinea	,,	Ordinary to fine ball	1/6 a 1/8
INDIGO, E.I. Bengal	,,	Shipping mid to gd. violet	3s a 3s 6d
	,,	Consuming mid. to gd.	2s 6d a 2s 11d
	,,	Ordinary to middling	2s 3d a 2s 5d
	,,	Mid. to good Kurpah	1s 10d a 2s 5d
	,,	Low to ordinary	1s 6d a 1s 9d
	,,	Mid. to fine Madras	1/9 a 2/3
MACE, Bombay & Penang		Pale reddish to fine	2/4 a 2/6
per lb.		Ordinary to fair	2/ a 2/2
Java		,, ,, good pale	2/ 1a 2/4
Bombay		Wild	1/
NUTMEGS,—	lb.		
Singapore & Penang	,,	64's to 57 s	9½d a 10½d
		80's	7½d
		110's	6½d
NUTS, ARECA	cwt.	Ordinary to fair fresh	17/6 a20/
NUX VOMICA, Cochin		Ordinary to good	9/6 a 12/
per cwt. Bengal		,, ,,	8/9
Madras		,, ,,	8/ 6 a9/6
OIL OF ANISEED	lb.	Fair merchantable	6/
CASSIA	,,	According to analysis	2/10 a 3/2
LEMONGRASS	oz.	Good flavour & colour	2½d
NUTMEG	,,	Dingy to white	1½d a 1⅞d
CINNAMON	,,	Ordinary to fair sweet	3½d a 1s 5d
CITRONELLA	lb.	Bright & good flavour	1/9
ORCHELLA WEED—Ceylon	cwt.	Fair	15/
Madagascar	,,	Fair	15/
Zanzibar	,,	Fair	15/
PEPPER—(Black)	lb.		
Alleppy & Tellicherry		Fair	5⅛d a 5½d
Ceylon	,,	Fair to fine bold heavy	5⅝d a 5⅞d
Singapore	...	Fair	5⅝d
Acheen & W. C. Penang		Dull to fine	5d a 5½d
(White) Singapore	,,	Fair to fine	8⅝d a 9d
Siam	,,	Fair	8¼d
Penang	,,	Fair	7⅜d
Muntok	,,	Fair	9⅛d
RHUBARB, Shenzi	,,	Ordinary to good	2/ a 3/6
Canton	,,	Ordinary to good	1/10 a 3/3
High Dried	,,	Fair to fine flat	1/ a 1/2
		Dark to fair round	9 d a 11d
SAGO, PEARL, large--cwt		Fair to fine	18/
medium	...	,, ,,	17/
small	...	,, ,,	13/ a 15/
Flour	...	Good pinky to white	11 a 12/
SEEDLAC	cwt.	Ordinary to gd. soluble	65/ a 85/
SENNA, Tinnevelly	lb.	Good to fine bold green	5½d a 8½d
		Fair greenish	3½ d a 5d
		Common specky & small	1¾ d a 3d
SHELLS, M. o' PEARL—		Small to bold	87/6 a £7 10/
Egyptian	cwt.	,, ,,	80/ a £9
Bombay	,,	Chicken to bold nom	10 17/6 a 14 2/6
Mergui	,,	Fair to good	£8 10/ a £14 15/
Manilla	,,	Sorts	50/ a 97/6
Banda	,,	Small to large	65/ a 97/6
Green Snail	,,	Trimmed selected small	
Japan Ear	,,	to bold	60/ a £7
TAMARINDS, Calcutta		Mid to fine bl'k not stony	13/
per cwt. Madras		Inferior to good	6/ a 10/
TORTOISESHELL—			
Zanzibar, & Bombay	lb.	Small to bold	11/ a 23/
		Pickings	10/ a 19/6
		Fair	12/
TURMERIC, Bengal	cwt.	Finger fair to fine bold	15/ a 17/
Madras	,,	Bulbs ,, ,, [bright	12/ a 13/
Do.	,,	Finger fair	14/ a 15/ nom.
Cochin	,,	Bulbs ,,	12/
VANILLOES—	lb.		
Mauritius ...	1sts.	Gd. crystallized 3½a 8½a in.	10/ a 15/
Madagascar ...	2nds.	Foxy & reddish 3½a ,,	10/ a 12/
Seychelles ...	3rds.	Lean and inferior	10/6 a 10/6
VERMILLION ...	lbs.	Fine, pure, bright	2/9
WAX, Japan squares	cwts.	Good white hard	51/

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